AVIATION WEEK

50 CENTS

Seven tons of wallop

Air Mail Special!

Air drops of heavy equipment like this field gun—shown leaving a Fairchild C-119 Packet—have gone a long way toward revolutionizing warfare.

But when you revolutionize war by transporting guns, tanks and trucks by air, you want to be mighty sure your airplane takes aboard *exactly the right amount of fuel* to fit in with proper flight planning.

Not more than you need—that would be useless weight. And definitely not less!

Helping to make sure ground crews do get exactly the right amount into the C-119's tanks are highly dependable Honeywell *electronic* fuel gauges. Because of Honeywell's high research, engineering and material standards, Honeywell electronic fuel gauges have the highest degree of accuracy.

This is only one of many Honeywell products now in use by the aviation industry. We expect the list to grow longer in future years. Because automatic controls are so important to aviation progress. And Honeywell has been the leader in *controls* for more than 60 years.

Aeronautical Division
Minneapolis-Honeywell • Minneapolis 13, Minn.

MINNEAPOLIS **Honeywell** H

Aeronautical Controls

STANDARD EQUIPMENT

This electrically operated gate valve is a typical example of the advanced engineering, research and manufacturing the aviation industry has gained from Hydro-Aire's wide experience. Today, this product, like other Hydro-Aire equipment—Hytrol Anti-Skid Braking Systems, Valves, Filters, Actuators, Hydraulic, Pneumatic and Electrical Accessories—has become Standard Equipment on America's leading airplanes.

HYDRO-AIRE

HYDRO-AIRE Inc.
BURBANK • CALIFORNIA
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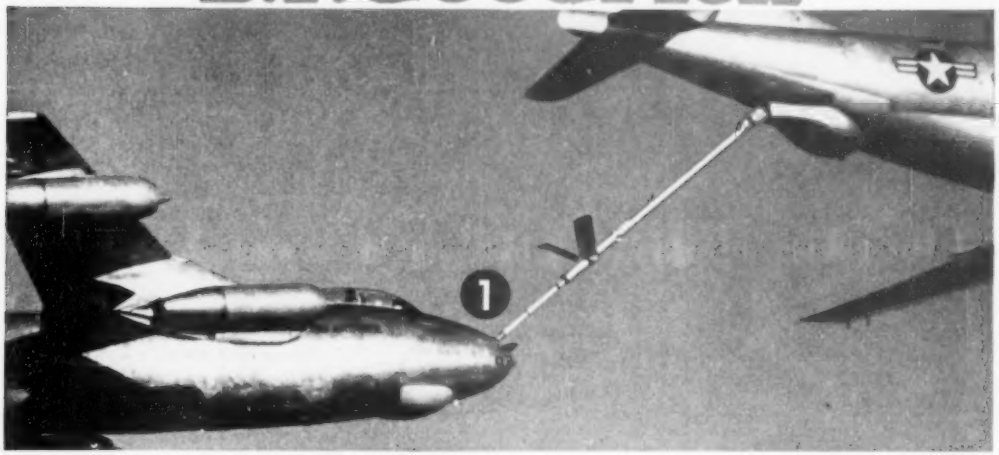
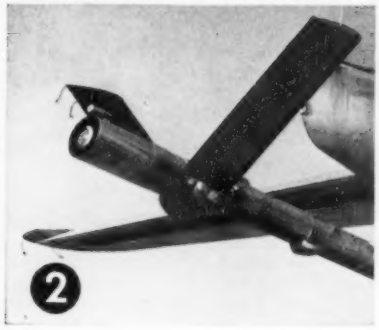
EVERY FIGHTER, EVERY BOMBER, EVERY TRANSPORT IS HYDRO-AIRE EQUIPPED

B.F.Goodrich





How rubber helps a bomber stretch its range

B-47 BOMBERS are refueled in flight by the Flying Boom—new telescoping pipe for in-flight refueling, developed by Boeing. Its vee-shaped ruddevators guide it into a fueling receptacle—special opening in the receiver ship. To make the boom practical, Boeing engineers faced three problems which they brought to B. F. Goodrich.

1. Ice forming in flight might choke up the receptacle, make it impossible for the boom to enter. B. F. Goodrich engineers suggested electric rubber—thin, tough rubber heated by a core of electric resistance wires. To fit snugly over bulges and around curves, BFG built the rubber in twelve molded sections. It fitted skin-tight over the contours of the receptacle, kept it ice-free.

2. Control surfaces of the ruddevators had to be kept free of ice. B. F. Goodrich again recommended heated rubber. Bonded to the leading edges of the ruddevators, pads of electric rubber supplied spot anti-icing heat, permitted accurate control of the Flying Boom.

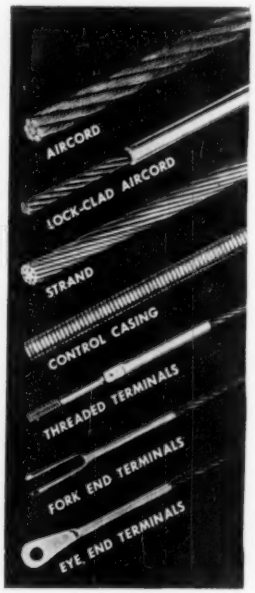
3. Sudden shutting off of fuel at the nozzle of the boom would deliver a kick which might damage the fuel pipe. Boeing had an idea for a "surge boot"—one rubber sleeve inside another with an air chamber between, which would act like a shock absorber to cushion the jolt. BFG came up with a boot of man-made rubber on nylon fabric. It was light in weight, didn't stiffen from cold, had the strength needed to take the kick of the surging fuel. It prevented damaging jolts to the pipe.

These are typical of the aviation developments that have come from B. F. Goodrich, leader in rubber research and engineering. BFG products for aviation include tires, wheels and brakes; heated rubber; De-Icers; Avtrim; inflatable seals; Pressure Sealing Zippers; fuel cells; Plastilock adhesives; Rivnuts; accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, O.*

B.F.Goodrich
FIRST IN RUBBER

AIRCRAFT CONTROLS

tops for every requirement



ROEBLING PRODUCTS for control in the air are available in a complete range of sizes and constructions...and all of them are built to the highest standards of quality. Cord is available in stock lengths or in complete assemblies as desired. There are fittings for every installation.

The first airplane to fly was Roebling equipped...and since those early days Roebling aircraft products have played a big part in helping assure safer and more dependable control.

Write for catalog material and full data on Roebling products that meet today's stringent specifications. Aircord Division: John A. Roebling's Sons Company, Trenton 2, N. J.

ROEBLING

Aviation Week

ABP Member ABC

Volume 56 — March 10, 1952 — Number 10

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Isn't this What YOU Want?

High Wing stability and visibility . . . *Smooth, service-proved* 145 H.P., 6-cylinder Continental Engine for fast cruising . . . maximum range . . . Patented Landing Gear for short, rough-field landings . . . Finger-tip controls . . . Luxurious interiors. You'll find them all in the 1952 Cessna 170—at a price several thousand dollars under any other 4-place, all-metal plane made!

The New Cessna 170

WITH NEW SUPER-LIFT FLAPS

proved in combat on the famous Cessna L-19 "Bird Dog" Army observation plane . . . NOW, available to you on the 1952 Cessna 170! These flaps reduce landing speed more than 10%. Combined with the Cessna patented landing gear, they give you shorter take-offs, safe landings even on short, rough fields . . . *exclusive* with Cessna!

CESSNA CASE HISTORIES

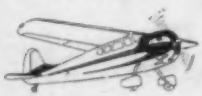
CONTRACTOR

DAIL CONAWAY, Denver, Colo., owns an air heating and sheet metal business, reports he can bid on and get jobs 500 miles away by flying there in his Cessna 170. He flies his mechanics, too—saves wages he'd ordinarily have to pay them for traveling. Other uses of Conaway's 170: visit his Casper, Wyo. office, his family in Kansas, suppliers in Iowa. Conaway says Cessna's all-metal construction is "good insurance against hailstorms," also praises his 170's high-altitude performance, visibility, economy.

LOAN AGENT

A. BRADY DE VORE, North Platte, Nebr., a small loan and insurance salesman, co-owns his Cessna 170 with a friend in the Title Abstract business. De Vore is a director in the Nebraska Small Loan Assn., flies to meetings in Norfolk, Grand Island and Omaha. Says he also uses his plane to appraise property, scout prospective clients, negotiate and manage small loans as far away as Denver. De Vore learned to fly his Cessna in 13 hours, says the plane is one "we definitely could afford and find completely satisfactory in all respects." It is the second Cessna for him and his partner.

ALSO SEE THE CESSNA 190 SERIES



Seats 5 with comfort, cruises at fast, airline speeds, carries up to 200 lbs. luggage, has all the safety and comfort features that make the Cessna America's best "big-plane" value on the market today.

FOR MORE INFORMATION . . . phone your nearest Cessna dealer or mail this coupon to Cessna Aircraft Company today . . .

Cessna Aircraft Co., Dept. AW-2
Wichita, Kansas

Please send information on the Cessna 170 ..... the 190 ..... I am interested in a Cessna for business ..... for farming ..... other .....

Name .....

Address .....

City ..... County ..... State .....

1949-50 and look at 1951-52

1949-50	Grumman	AF-1	A. V. Roe	
	Douglas	C124	Northrop	C-125
	North American	T-28	Lockheed	P2V-3
1948	Douglas	DC-3	Sikorsky	XHJS-1
	Boeing	YB-50C, C-97	Piasecki	XHJP-1
	Consolidated	L-13	Fairchild	C-119
1947	Grumman	Mallard	Canadair	DC4M-1
	Chance Vought	F4U, F4U-4		DC4M-2
		F4U-5		
1946	Lockheed	049, 649, 749 (Constellation)	Cessna	UC-78 (Bobcat)
	Douglas	SB2C, BTD (Dauntless)	Martin	AM-1Q
1945	Douglas	C-54E, DC-6	Noorduyn	C-64 (Norseman)
		XC-112,	Hughes	F-11
		DC-3, DC-4	Fisher	P-75
	Northrop	P61C, F-15	Grumman	F7F (Tiger Cat)
	Lockheed	P2V-1		
1944	Douglas	C-54B, A-20H	North American	P-51, B25J (PBJ)
		A-20K, A-26B	Northrop	P-61B
		JD-1, C-47		
	Boeing	307, B-29	Lockheed	C-69
	British	Lancaster	Martin	JRM-1 (Mars)
	Canadian Vickers	PBV	Budd	RB-1 (Conestoga)
1943	Douglas	C-54, C-54A (Skymaster), A-20 (Havoc), C-74 (Globemaster)	Eastern Aircraft	TBM1-C
			Stinson	L-5
			Boeing	N2S
	Curtiss-Wright	C-76, R5-C	Piper	L-4
		C-46 (Commando)	Consolidated	PBY

Here's the latest list of aircraft served by Janitrol heaters, to top the 1950 record reported last year in the ad reproduced at the left. The score for 1951-52 points again to Janitrol's leadership in aircraft heating dependability.

AVRoe	C-100
Beech	Model 50
Bristol	Freighter
Chance-Vought	F4U-7
Chase	C-123B
Convair	CV-240 (modification), Turboliner
de Havilland	Otter
Douglas	Super DC-3, DC-6A, DC-6B, C-124A, DC-7
Fairchild	C-119H
Goodyear	ZPN Dirigible
Grumman	S2F-1
Lockheed	1049 (Connie), P2V5, P2V6
Martin	4-0-4, 202-A
North American	T-6J
Piasecki	HUP-1, HUP-2, and H-21
Sikorsky	H-19, HOSS-1, S-55

just plane addition...

. . . points to unquestioned leadership of Janitrol heaters. There's no better proof of performance than the long list of fine aircraft which are Janitrol-equipped . . . For the smallest or the largest airplane—for all heating requirements—in flight, or on the ground—Janitrol heaters will live up to the severest specs. They're as compact, as lightweight, as sturdy, and as dependable as modern engineering can make them. You'll be well advised, whatever your heating problem, to call in your nearest Janitrol representative early in the design stage. A phone call will put him at your service.

Janitrol

AIRCRAFT AND AUTOMOTIVE HEATERS *with the whirling flame*

AIRCRAFT - AUTOMOTIVE DIVISION • SURFACE COMBUSTION CORP., TOLEDO 1, OHIO

F. H. Scott, 225 Broadway, New York, N. Y. • C. B. Anderson, 2201 Grand Ave., Kansas City, Mo. • L. A. Curtin, 7046 Hollywood Blvd., Hollywood, Calif. • F. H. Scott 4650 East-West Highway, Washington, D. C. • Phil A. Miller, Frank Deak, USAF Coordinator, Central District Office, 400 Dublin Ave., Columbus, Ohio • Headquarters, Toledo, Ohio

NEWS DIGEST

DOMESTIC

National Airlines has ordered four Douglas DC-7s, which observers believe will give NAL a decided speed advantage over Eastern's Super Commes on the highly competitive New York-Miami run.

Piper PA-23 Stinson four-placer made its first flight Mar. 2, several weeks earlier than had been expected. The new craft (AVIATION WEEK Mar. 3, p. 16) has since flown on one engine satisfactorily.

Navy has assigned the letter "V" to designate all Lockheed aircraft, dropping the "O" formerly used. New designations for Lockheed Navy planes (former nomenclature in parenthesis): R6V-1 (R6O-1), R7V-1 (R7O-1), R7V-2 (R7O-2), WV-1 (PO-1W), WV-2 (PO-2W), TV-1 (TO-1), TV-2 (TO-2).

Nathaniel F. Silsbee, 56, executive secretary of the Corporation Aircraft Owners Assn., died Feb. 15 in Washington, D. C. following a virus infection and was buried in Arlington National Cemetery. He was a veteran aviation writer and editor. His articles appeared in AVIATION WEEK and other leading publications. He had served as technical editor of Skyways and managing editor of Aero Digest and was four-time winner of TWA's Technical Writing Trophy. In World War II he headed the Information, Education and Research Section of AAF's public relations organization and later held a colonel's commission in the Air Force reserve.

AF Special Weapons Center will be new name of AF Special Weapons Command, Kirtland AFB, Albuquerque, when it becomes part of the Air Research and Development Command Apr. 1. SWC will continue its work on atomic weapons.

FINANCIAL

Flying Tiger Line will place its 5% preferred stock on a semi-annual dividend basis payable May 1 and Nov. 1 each year.

Bendix Aviation Corp., South Bend, Ind., reports sales of $111,522,000 for the first quarter of the 1952 fiscal year ended Dec. 30. Backlog as of Feb. 1 was approximately $705 million.

Boeing Airplane Co., Seattle, has called for a special stockholders meeting on Apr. 22 to vote on a proposal to increase the number of shares that may be issued by the company from 1.25 million to 2.5 million. There are currently 1,082,454 shares outstanding. Boeing has declared a $1 dividend payable Mar. 21 to holders of record on Mar. 11.

United Air Lines will offer approximately 224,000 shares of cumulative convertible preferred stock, $100 par value, to its common stock holders at the rate of one share preferred for each 11 common shares. The offering will be made Mar. 19 and subscription rights expire Apr. 2.

Northwest Airlines notes a net loss of $464,095 for January compared with a $677,744 loss the same month last year. Operating revenues this January totaled $3,412,390.

Northrop Aircraft, Inc., has declared a 25-cents-per-common-share dividend payable Mar. 21 to holders of record Mar. 11. An unaudited statement for the quarter ended Jan. 31 showed profit of $431,463, after estimated federal income and excess profits taxes, on earnings of $1,439,363. Backlog at that time was about $245 million, not counting approximately $105 million in contracts under negotiation.

Pioneer Air Lines reports $194,078 net profit after taxes for its 1951 operations compared with the previous year's figure of $165,574.

Ryan Aeronautical Co. reports gross revenue of $22,277,175 for fiscal year ended Oct. 31, compared with $12,312,851 for the previous year. Earnings were $827,604 before taxes, $402,604 after taxes. Fiscal 1950 net was $635,165.

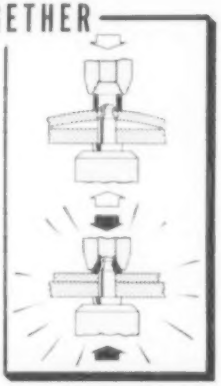
INTERNATIONAL

Prototype Arsenal VG 90 sweptwing jet fighter crashed Feb. 21, killing one of France's top test pilots, Claude Dellys, who was on loan to Arsenal from SNCASO.

Air France SE-161 Languedoc crashed soon after takeoff from Nice, France, Mar. 3, killing 37 aboard. Early reports said that the plane's two left engines had failed.

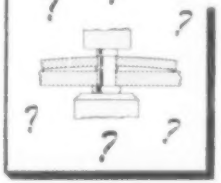
Panair Do Brasil transport crashed Feb. 18 near Uberlandia, Brazil, while trying to land during poor visibility. The plane carried 27 passengers and crew of four.

hi-shears
DRAW THE WORK TOGETHER



HI-SHEAR collar opposes the rivet head. Acts as own draw set, automatically draws work together — instantly — firmly.

Conventional RIVETS



A conventional aluminum rivet "flashes" unless riveter draws work together in a skillfully executed progressive operation. A "flashed" rivet requires careful removal — danger of serious spoilage.

Naturally, we don't recommend extreme pre-loading, a condition that should be detected by inspection in accordance with rule standards prior to riveting. But, a better solidity to draw the work tightly together is an important quality because it produces a better connection, saves fitting up and riveting time and reduces work spoilage.

U.S. and foreign patents — Trademark registered

THE *hi-shear* RIVET TOOL CO.
8924 BELLANCA AVENUE
LOS ANGELES, CALIF.

FOR THE TOUGHEST JOBS
PICK THE HUSKIEST

Trim Trol

Model R-220

The huskier model TrimTrols—R-220 and R-174—are being used in increasing quantities where great strength and endurance are required. Rightly so. Although these models weigh only 3½ pounds, they have an ultimate static load capacity of 2,400 pound-inches and operate loads over 300 pound-inches through 160° rotation. Zero backlash, magnetic brake, adjustable limit switches, positive overtravel stops, adjustable position-indicating potentiometer, and built-in radio noise filter are features of these Trim-Trols.

Models R-220 and R-174 are identical in performance, but differ in mounting arrangements.

The newer, lighter TrimTrols—R-420 and R-422—weigh 2¼ pounds and have an ultimate capacity of 1,500 pound-inches.

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AVIATION CALENDAR

Mar. 10-12—Purdue Airport Management and Operations School, Purdue University, Lafayette, Ind.

Mar. 11-14—National Plastics Exposition, Convention Hall, Philadelphia.

Mar. 14—National Flight Propulsion Meeting, Institute of the Aeronautical Sciences, Cleveland.

Mar. 17-19—Second Midwestern Conference on Fluid Mechanics, to be held at Ohio State University.

Mar. 17-21—American Society of Tool Engineers industrial exposition and annual meeting. Theme: "Tooling for Security." Chicago. (For information, write Denham & Co., 812 Book Building, Detroit.)

Mar. 20—Institute of the Aeronautical Sciences Los Angeles section dinner meeting; speaker—Wellwood Beall, Boeing Airplane Co.; Los Angeles.

Mar. 20-21—Conference, Cooling of Airborne Electronic Equipment, to be held at Ohio State University in cooperation with USAF. Technical papers will be presented by AF, electronics and aircraft industries, and research organizations; Ohio State University, Columbus.

Mar. 20-22—Aircraft Operators Council annual conference, Hollywood Roosevelt Hotel, Hollywood, Calif.

Mar. 24-26—American Society of Mechanical Engineers spring meeting, University of Washington, Seattle.

Mar. 30-Apr. 3—Convention of American Association of Airport Executives, Ft. Worth.

Mar. 31—Technical Societies Council of N. J. annual conference; panels on metal working and quality control; Essex House, Newark, N. J.

Apr. 1-4—22d annual Greater New York Safety Convention & Exposition, Hotels Statler and New Yorker, New York.

Apr. 3—Conference on safety problems of aviation, in conjunction with 22d annual Safety Convention of Greater New York Safety Council; Col. Gilbert F. Teal, USAF, will preside; Hotel Statler, New York.

Apr. 21-24—National Aeronautic Meeting and Aircraft Engineering Display, Society of automotive Engineers, Hotel Statler, New York.

Apr. 22—Institute of the Aeronautical Sciences meeting, Cleveland-Akron section, Cleveland.

Apr. 28—International Air Transport Assn. Warsaw Convention special committee meeting, Bermuda.

May 8-9—Fifth annual Wisconsin Aeronautics Conference, Green Bay.

May 12-14—National conference on airborne electronics, co-sponsored by Institute of Radio Engineers' Dayton section and Professional Group on Airborne Electronics, Dayton Biltmore Hotel, Dayton, Ohio.

PICTURE CREDITS

9—(top) USAF; (center) Northrop; (bottom) Lockheed; 14—(top) Glenn L. Martin; (bottom) Wide World; 16—Wide World; 18—Defense Department; 21—USAF; 30—(top) de Havilland; (bottom) BOAC; 32—de Havilland; 66—McGraw-Hill World News.

CONVAIR DELTA PROGRESS—The neat little Convair XF-92A delta, resplendent in bright paint, shows off its new elongated afterburner, which adds substantially to the thrust of its Allison J35-A-29 turbojet. Craft soon will be handed over to NACA for research.

SCORPION'S AIR BRAKES OPEN—Northrop F-89D (above) demonstrates action of its clam-shell "decelerons" which serve dual function as ailerons and speed brakes. Their considerable area permits pilot to vary speed rapidly when engaging target, allows steep descents without exceeding Mach redline.

Plane News In Pictures

SUPER CONNIE TAKEOFF TRIAL—Lockheed 1049 (right) heads skyward at a steep angle immediately after taking off from Lockheed Air Terminal, Burbank. This particular Super Connie is used by Lockheed as a flying laboratory to test new equipment.

Small and lightweight, G-E's new static-type voltage regulator is both fast and precise. Voltage regulation from no load to full load is better than ±2.5%, while recovery to ±3% of rated voltage occurs in less than 0.1 seconds after release from extreme conditions of load.

Strength and dependability are built compactly into the regulator. Operation is unaffected by aircraft pitch, roll or yaw, or accelerations of 10 g. There are no tube filaments, no fragile components, almost nothing to wear out. Operation is good to above 50,000 ft., and between −67 F and +160 F.

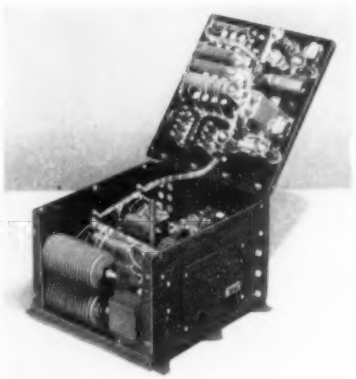
New Static Regulator for Aircraft Alternators Has No Carbon Stacks

Can withstand 10-G acceleration; Remains stable throughout life

Designed to military specification MIL G-6099, this compact new static-type voltage regulator eliminates routine maintenance, reduces replacement costs, permits better aircraft electric system performance under extremes of altitude and temperature and eliminates exciter reversal problems. Both small and rugged, the regulator is designed to control G-E's new line of high-performance aircraft alternators.

Note these significant features:

- **Expected useful life above 5000 hours**
- **No carbon stacks**
- **Ready to operate—no warm-up required**
- **Can be used with alternators either wye- or delta-connected**
- **Negligible voltage drift with temperature**



In G-E's new lines of alternators and voltage regulators the advantages of light weight, compactness and reliability of a-c electric systems are available for your aircraft installations. But whether your problem is a-c or d-c, a single instrument or complete electrical system, contact your General Electric aviation specialist, or write the General Electric Co., Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

21042

WHO'S WHERE

In the Front Office

Luther Harris, formerly vice president of Pacific Airmotive Corp., Burbank, has been named executive vice president for Aircraft Engine & Parts Corp., N. Y. Harris was director of maintenance for the Berlin Airlift. His aviation experience dates back to 1917.

George K. Otis has been designated a vice president of Lear, Inc., will continue as general manager of the LearCal division, Los Angeles, which handles development, production and sales of autopilots for itinerant aircraft, as well as aircraft radio and electronic navigation aids for personnel and commercial planes. **Don Fairchilds** has been appointed advertising director for LearCal.

Changes

Darrol Davison, director of engineering, Southwest Airways, has been named director of engineering and maintenance.

O. A. Byrne, formerly general traffic and sales manager for Frontier Airlines, has been appointed assistant to the general manager of Colonial Airlines; **Irene Replogle** has been named interline and public relations representative, and **Rita V. Copelman** has been designated office manager at the carrier's Park Ave. offices in N. Y. C.

Edward J. Doucet, Jr., has been made advertising manager of Vickers, Inc., hydraulic equipment maker, Detroit. He previously was sales engineer in the Detroit district office.

Harold F. Bichsel has been appointed manager of the New York office of B. F. Goodrich Co.'s Automotive, Aviation and Government division, succeeding **James A. Reed**, who becomes special aviation sales representative to eastern aviation firms.

Stanley D. Margerum has joined R. M. Hollingshead Corp. as special products manager for the Industrial-Aviation division.

J. Robert Rowley, assistant manager of public relations for Fairchild Aircraft division, has resigned to join the Washington, D. C., office of Carl Byoir & Associates, public relations firm.

H. W. Rickert has succeeded **D. C. Burrows** as assistant division manager (administration) of the Convair Guided Missile division and will also continue as the division's manager of material. Burrows is leaving the company to become president and general manager of Hayward Industries, Inc., Glendale, Calif., aircraft and missile parts.

What They're Doing

John T. Shannon, vice president of Panagra (Pan American-Grace Airways), has left the carrier after 21 years of service.

Bruce Del Mar has formed Del Mar Engineering Laboratories, a new company to handle aviation development projects. Address, 3921 W. Slauson Ave., Los Angeles 43. Del Mar, who is chief engineer for the new firm, was formerly special projects engineer with Douglas Aircraft Co., Santa Monica.

INDUSTRY OBSERVER

► North American Aviation has delivered the last of its Downey, Calif. production of AJ-1 Savage attack bombers and has now switched completely the production of this plane to its Columbus, Ohio plant.

► **Mooney Aircraft Inc., Wichita, is developing a new four-place business and personal plane, as a running mate to the tiny Mooney one-place M-18s. The all-metal low-wing four-placer, with tricycle gear, is powered with a 145-hp. engine, and is credited with a top speed of around 160 mph.**

► Lockheed Aircraft Corp.'s new special projects center at Burbank, will have the construction of the new Air Force XC-130 turboprop cargo transport plane, as its first assignment. Except for a few fabricated parts made elsewhere all structure and assembly work on the XC-130 will be done at the special projects center, laid out specifically for construction of prototype aircraft.

► **Thirty-six of 40 Handley Page Marathons, originally designed for British European Airways as feederliners, are to be modified for Royal Air Force use as trainers. Remaining four go to British West African Airways. Plane was too large for BEA's proposed routes through Scottish islands where DH Rapide biplanes are still adequate for the traffic.**

► Second French firm to build American copters under license is Societe Nationale des Constructions Aeronautiques du Nord, which will produce the Bell Model 47 D1. Earlier agreement made SNCA du Sud-Est licensees for the Sikorsky S-55 (AVIATION WEEK Feb. 11, 1952).

► **SNECMA, the nationalized French aircraft engine builder, is currently tooling to build the British Bristol Hercules piston engine under license. The French-built versions will be used to power the SNCAN Nord 2500 twin-engine medium transport, of which 175 are on order for the French air force.**

► Ryan Aeronautical Co. has been assigned an Air Force North American F-86 fighter and a Navy Lockheed P2V patrol bomber, for flight test work on new applications of subminature radar equipment, under projects growing out of the early Ryan Firebird guided missile.

► **Construction of the new Navy-owned plant for assembly of Westinghouse J40 jet engines at Romulus, Mich., near the new Lincoln-Mercury assembly plant at Wayne, Mich., was due to start this month, with completion next year. The $50-million Navy plant will include 18 engine test cells, and will be operated by Ford's Lincoln-Mercury division in conjunction with the Wayne plant where J40 parts will be built.**

► The first Martin-built B-57 Canberra intruder bomber is expected to fly early in the summer 1953.

► **Army aviation leaders are looking forward to the use of photo reconnaissance guided missiles for close-range recon work in addition to artillery spotting and reconnaissance work now being done by airplanes.**

► McDonnell Aircraft again is flying an XF-88A Voodoo for the first time since August, 1950. Mac built two of the planes for USAF. Both were sent to Edwards AFB, Calif., and one was badly damaged in a landing accident. Later, one was ferried back to St. Louis and had not been off the ground until test pilot Phil Houghton flew it Feb. 5.

► **Judging by the material allocations to lightplane manufacturers in the C-5 program (Aviation Week Mar. 3, p. 18) Cessna Aircraft has two new models planned, including the previously reported twin-engine plane. The allocation chart shows a Model 180 and Model 310, both by Continental 225-hp. engines turning a Hartzell prop. The Model 180, according to the C-5 program, is scheduled to start in production in December of this year with five planes. The rate will build up to 480 for the year in 1953. The Cessna twin most likely is the Model 310, scheduled to go into production, according to the allocations, in September, 1953.**

Washington Roundup

Naval Air's Offensive

Naval Air, which maintained a silent defensive while the Air Force ascended to dominance in the defense picture over the two years following the famed B-36 investigation, is now taking a confident offensive for greater recognition.

Navy's 1949 offensive was to demerit the Air Force, specifically intercontinental bombing and the B-36.

Navy's offensive now is going to be based on the merits of Naval Air. It is the difference between negative and positive approach.

Developments have paved the way for Naval Air:

- **Korean War** put forth the prospect that the U. S., whose military plans until then were concentrated on a straight U. S.-Russian conflict might have to meet the Russian threat at points around the globe.
- **Atomic bombs** have been developed for carrier planes.
- **Foreign commitments** have obligated the U. S. to "hold" vast land areas around the globe—a mission to which strategic air can make no contribution.
- **Russian advances** in air defense and interceptor aircraft have minimized the possibility of unescorted bombers cutting through its barriers.

Figuring prominently in Naval Air's push will be enthusiastic Assistant Secretary for Air John Floberg. His military adviser will be the top flight tactician, Capt. John S. ("Jimmy") Thach, just back from Korea.

The latter is best known for the "Thach Weave"—a fighter tactic that first proved itself in Naval maneuvers shortly after Pearl Harbor, was later adopted by USAF.

In command of the Sicily—first carrier to sail for combat duty from the West Coast after the outbreak in Korea—he directed "Thach Roof" close air support for troops from the days of retreat to Pusan to the days of deadlocked peace negotiating.

This is Naval Tactician Thach's outlook:

ATOMIC ATTACK ON U. S.

Likelihood is that it'll be launched from submarines—not intercontinental bombers.

Air Force's report that regardless of an adequate air defense system 30% of enemy bombers could cut through to wipe out U. S. cities with A-bombs has stirred vast concern in Congress.

Thach's comment: "It could not be done without unacceptable losses on the enemy. That's the deterrent. It is well known by most people that an interceptor can shoot down any other type of plane except a better interceptor. It's a waste of money to purchase interceptors if they are not able to shoot down any other type of plane."

MAJOR THREAT: SUBS

It's Naval Air's four-fold mission to meet this major threat to military success: knock out sub bases; attack training areas; hunt down subs en route to attack; protect convoys.

"Location of sub bases are well known—they're all at the water's edge—and a major target of carrier planes."

► **First Line of Defense?**—As in Korea, in any war "troops will meet troops right from the start—unless the U. S. becomes completely isolationist, and a completely isolated U. S. will not have the strategic materials to sustain effective military arms. We could not build electronics, aircraft, or ships."

MEASURE OF COMBAT SUCCESS

In any future war as in past wars, our measure of combat success—the key to keeping allies and fighting morale—will be "how much real estate we hold."

"In this, close air support will be extremely important. We must have control of the air at the right times and places to accomplish this goal of holding ground."

(Army concurs. But some USAF strategic air proponents contend a first knock-out air punch will be the decisive factor in any future war.)

► **Tactical Support: Jets or Prop-Planes?**—They are complimentary: It isn't a question of jets replacing slower propeller aircraft.

Propeller planes can't meet jets in combat. But after jets have gained air control over an enemy area, propeller aircraft, with greater range and load capacity, are more effective in delivering devastation.

(USAF looks to the jet eventually to replace piston-driven planes for close support.)

CARRIER: WHAT FUTURE?

"The fast carrier task force hasn't yet been exploited to its fullest ability.

"But in the Pacific it proved it could win over superior numbers of enemy land-based air power—because we knew where they were, but they never knew where we were, and we met the threat of guided missiles. And these guided missiles, the suicide Kamikazes, had human pilots. The sub certainly doesn't spell out the end of the carrier. No Essex class carrier has been sunk, or even stopped, by a sub. Subs will get faster, but so will carriers."

► **"Attack" Seaplane**—Navy should push development of high-performance "attack" seaplanes, possibly jets.

They have one great advantage: "A tremendous landing field in all the protected water over the globe."

And Navy is keeping a close eye on development of the atom-powered planes for possible seaplane adaptation.

BALANCING FORCES

Navyman Thach concurs with Air Chief Gen. Hoyt Vandenberg's thesis that U. S. forces should be "balanced" to meet the Russian threat, exploiting U. S. advantage against Russian weakness. But here the two part company.

Vandenberg urges more land-based air power to overcome Russia's overwhelming superiority in ground troops.

But Thach proposes:

"Communist forces have more troops than we have and they have been out-producing us in land-based air power for some years.

"Where are they weak? In sea power. It certainly makes good sense to exploit our strength against their weakness. By putting in commission modern aircraft carrier and amphibious forces in sufficient strength we can make amphibious landings wherever and whenever we choose."

► **And the Future**—Air Force looks to the satellite for the limitless-range atom-powered plane capable of raining down devastation.

—Katherine Johnsen

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USAF Reveals Role in New NATO Plan

- **Top official says U. S. will pay more than half cost of the aircraft called for under Lisbon program.**
- **Most of money will go for tactical planes, less than one-fourth for light bombers, less for transports.**
- **And backing up NATO air power will be 143-wing USAF which official calls 'whale of a power.'**

By Ben S. Lee

U. S. funds will pay for over half the cost of Western Europe's aircraft rearmament program until European aircraft production reaches its peak, a top Defense Department official told AVIATION WEEK last week.

Outlining the broad details of the North Atlantic Treaty Organization procurement program for military aircraft, he said that over half of the total funds is allocated for tactical fighters, less than one-fourth to light bombers and the remainder to troop transports.

The NATO meeting at Lisbon, Portugal, last month agreed to spend $300 billion and to spread the cost of arming Western Europe against the threat of communism to the 14 member nations in proportion to their economic capability.

Of the total forces to be provided by the $300 billion, 50 divisions of troops and 4,000 planes will reach Gen. Dwight D. Eisenhower by the end of calendar 1952. Exact breakdown of funds by nations to provide those men and planes is at present classified top-secret.

The Air Force's 126 combat-wing structure (plus 17 troop carrier wings) includes U. S. wing assignments to NATO. He said this had been agreed upon by the U. S. Joint Chiefs of Staff as "adequate."

While Defense Department would like a much larger U. S. Air Force, just as it would a larger Army and Navy, "to make things even safer from a military point of view," he said, "present and planned military strength requirements are joint decisions by all three services.

"Contrary to opinion in some quarters," this source said, "the presently financed 95-wing structure is a powerful force for safeguarding the U. S., and the authorized 143-wing Air Force is a whale of a power."

▶**Only Tactical Air**—As had been previously planned—but not officially agreed to by member nations of the North Atlantic Treaty group until the recent Lisbon meeting—Western European nations will concentrate solely upon tactical air weapons. This is true, of course, only insofar as NATO operation is concerned. Each of the member nations will provide such other air defense craft and measures as their individual national budgets permit, he said.

In providing this unified defense program for mutual assistance, member nations agreed to call upon the industries and economies of each nation in full proportion to their capabilities. With relation to air forces, this means that the United States—Air Force and Navy—will be procuring from England and France combat parts, equipment, accessories and services not only for utilization by this nation's NATO activities but for NATO activities of its allies.

For example, the English Electric Canberra (U. S. B-57A) licensed for manufacture in U. S. at the Glenn L. Martin Co., will be delivered not only to U. S. light bomb wings but may also be delivered to combat units of NATO members for night intruder work.

▶**NATO to Get B-66**—The Douglas B-66 (Navy A3D), now in flight test and soon to go into full production (see page 16) at World War II Chicago-Orchard Park, Ill., plant, will fill the U. S. tactical light bomb wing requirements for a day bomber as well as the NATO group's requirement.

The Republic F-84 Thunderjet—in alphabetic series E, G, F—has been standardized upon by the NATO group for tactical fighter-bomber activities in connection with close ground support operations. The series G, equipped for in-air refueling, is now being tested for tactical atomic bomb technique at Langley AFB. Results of new advanced tactical air weapons now in service test will be incorporated into the F-84F and probably in all subsequent F-84 versions.

The North American F-86, originally designed for tactical operation, is currently undergoing metamorphosis to intercepter as a result of its Korean experience against the Russian MiG. Although it is not presently standardized upon by NATO as the best fighter of its type, it is likely to become so by default since there is nothing currently in production which out-classes it.

The F-86 is in production in two major U. S. plants, one in Canada and is soon to go into production in Australia. At present, U. S. and Canadian versions are equipped with the GE J47, while the Australian version will be equipped with the Rolls-Royce Avon. It is likely that the Navy version FJ-2, just entering production at North American's Columbus plant, also will be delivered to carrier units of the British and French fleets late in 1953.

▶**No NATO SAC**—The U. S. Strategic Air Command, equipped with

This Is NATO Structure

● The North Atlantic Treaty Organization grew out of Western Union Treaty signed at Brussels four years ago next week by U. K., France, Belgium, Netherlands and Luxembourg (Last three are the "Benelux" nations). . . . NATO itself is three years old next month; treaty was signed in Washington Apr. 4, 1949. . . . Present members: U. S., Canada, U. K., France, Benelux, Norway, Denmark, Italy, Portugal, Iceland, Greece, Turkey. . . . Top group in NATO is council which generally meets twice a year. . . . Council members are cabinet officers of member countries. . . . In U. S., NATO aid is dovetailed with other foreign aid through Director of Mutual Security (W. Averell Harriman) responsible directly to President. . . . Mutual Security Program ends June 30, 1954. . . . As of Dec. 31, 1951, USAF had shipped 952 aircraft, Navy, 365, and 291 other aircraft had been flown to countries participating in MSP.

B-29s, B-50s, B-36s and soon the Boeing B-47, B-52 and/or the Convair B-60, is the only arm of U. S. defense which will not find its counterpart in the NATO makeup. There are no present plans to deliver either the B-36 or the B-47, or the yet to come B-52 and B-60, to any other NATO nation.

This does not mean, however, that some of these craft will not be based on Allied soil. To the contrary, most U. S. bases strung across England, France, and North Africa to the Middle East contemplate B-47 and possibly "big-heavy" utilization.

Previous reports that the British Vickers Valiant, a four-jet bomber, would be licensed for manufacture in the United States for assignment to medium bomber role, were refuted by this Defense Department source. He also stated that there were no plans to set up an English plant for B-47 production—a report which had been widely circulated in the United States.

Forthcoming interceptor aircraft to be assigned to air defense missions within the United States also will play no part in the NATO program for mutual defense. While a number of U. S. wings are now flying jet fighters on air defense missions within U. S. borders, it remains for production of the Convair XF-102 and other such planes to follow to fill adequately the air defense interceptor role for U. S.

These planes would be very fast, short-ranged weapons-carriers designed solely to intercept enemy bombers attacking the U. S.

► **Details of XF-102 Role**—The XF-102, which was just ordered into prototype production by Air Force, is a delta-wing, single-place, J57-powered plane developed from the Convair delta-wing XF-92A. The new delta-wing will be equipped with a full automatic electronic pilot, in manufacture by Hughes Aircraft, and will carry a human pilot only as monitor. Weapons equipment will be a guided missile. Speed of the interceptor is supersonic.

The Defense spokesman, after discussing the role of U. S. Air Force in NATO planning, commented further on over-all U. S. procurement planning in relation to the recently announced stretch-out of aircraft procurement. His views, which can be considered virtually an official statement on the subject, are as follows:

"While explanation of planning factor is complex, assignment of a date such as mid-1952, 1953, 1954, 1956, etc., does not mean necessarily that we expect an attack by an aggressor at one of those times but means instead that our forces contemplated to be in balance at a given time would be able to meet that of an aggressor whose capabilities for waging a war are being continually assessed.

"The so-called stretch-out in Air Force and Navy aircraft deliveries has been influenced by several factors. Prime one of these is, of course, economic. This stretch-out was not arrived at willy-nilly, but has been based upon good sound advice, for the most-part from the manufacturers themselves. It is doubtful if a single major manufacturer within the industry could be found to dispute the wiseness of the stretch-out.

"Admittedly the stretch-out results in a higher unit cost per plane, yet the stretch-out accomplishes a leveling out of production across a longer period without the previous ever-present peaks and valleys. The industry has pleaded for this planned production for nearly ten years. Now they have it.

"If an emergency should develop anywhere along the stretch-out in production and delivery time, there is no doubt in the military mind that the industry and the attendant 2nd source mass producers will be able to step up production to meet the need."

MARTIN'S NEW PRESIDENT

George M. Bunker, 44, picked as financial trouble-shooter at Glenn L. Martin Co., has assumed duties as president and general manager of the Baltimore concern, taking with him J. B. Wharton as vice president-finance. Bunker and Wharton previously held similar posts with Trailmobile, Inc., Cincinnati, a Pullman Co. subsidiary. C. C. Pearson, former Martin president, and Richard Johnson, former vice president-finance, are still with the company to assist the new appointees in getting started.

NAVY TAKES MASS DELIVERY OF HUP-2s

Half-dozen Piasecki HUP-2s, just handed over to U. S. Navy, at Philadelphia International Airport, provide an imposing sight as they hover over the field. The twin-rotor, six-place all-metal copters will handle utility duties aboard carriers, including rescue missions. The HUP-2 features a Sperry autopilot, a device calculated to ease the pilot's job even under instrument flight conditions.

Mid-West Buys DC-3s

Mid-West Airlines has bought 10 Eastern Air Lines DC-3s and hopes to start taking delivery of them this spring. Basic price is reportedly somewhere between $35,000 and $45,000 each; a premium price over that is to be charged by formula for each useful hour of flight time left on each plane before major overhaul.

Get in the Scrap—Turn Yours in for Defense

Vandenberg Stays In, LeMay Is Vice Chief

Air Force Chief of Staff Hoyt Vandenberg, whose appointment in that post was scheduled to expire Apr. 30, has been renominated by President Truman for a short term.

The new appointment will be of short duration and is scheduled to conclude shortly after Vandenberg completes his 30 years service June 12, 1953. Announcement of his reappointment was made after a special meeting of the Joint Chiefs and the civilian Secretaries with Defense Secretary Robert Lovett.

The White House simultaneously announced appointment of Gen. Curtis LeMay to replace Gen. Nathan F. Twining as Vice Chief of Staff. Twining takes LeMay's post as Commanding General, Strategic Air Command.

Reshuffle of the Vice Chief of Staff post to LeMay gave credence to previous reports that he eventually is slated to replace Vandenberg as Chief of Staff. Apparent reasoning behind the move is to put LeMay in a role which will enable the Air Force and Administration to test his ability as a diplomat and arm-chair strategist.

Previously he had been in some disfavor with the State Department because of his bluntness.

The decision, late as it was in coming, has put an end to considerable confusion within the military establishment where certain projects have been held up because of possible change in top command.

30th Air Division To New Quarters

A new, multi-million dollar self-sufficient installation near Willow Run, Mich., will house headquarters, 30th Air Division, within a month. The unit —nerve center of the AF's entire air defense for Michigan and six other states —is moving from Selfridge Field, Mich.

"We'll be doing the same job we were doing at Selfridge," said Col. Edwin Tucker, commanding officer, "only under less crowded conditions."

The job: to guard Michigan, Ohio, Indiana, Kentucky, Illinois, Wisconsin and West Virginia against air attack. Jet fighters in those states are under direct command of the division.

The installation also commands a secret force of fixed anti-aircraft units.

The new installation employs facilities for tracking electronically the approach of any aircraft. It is completely self-sufficient, possessing its own powerplant and maintaining an alternate telephone control system for use in case local commercial communications systems should be destroyed.

Gen. Joseph T. McNarney

Heads Convair

- **Gen. McNarney is named to succeed Cohu.**
- **Former president given new company post.**

Consolidated Vultee Aircraft Corp. last week dipped into the pool of retired Air Force general officers and elected the highest ranking senior of them all, Gen. Joseph T. McNarney, to head the aircraft company, succeeding LaMotte T. Cohu as president.

Holder of such important postwar military jobs as chairman of the Defense Department's powerful Management Committee and commanding general of Air Materiel Command, Gen. McNarney was a top military leader in World War II. In 1943 he was Deputy Chief of Staff of Army, and in 1944 Deputy Supreme Allied Commander in the Mediterranean Theater and commanding general of U.S. forces in that area. In 1945 he became Acting Supreme Allied Commander, succeeding Gen. Dwight Eisenhower.

According to Floyd B. Odlum, Convair board chairman, Cohu simultaneously was elected vice-chairman of the board of directors. Both officers will assume their new posts Apr. 1.

Odlum said that Convair was fortunate in obtaining the services of a man who had 35 years military service "particularly as an administrator and executive." Gen. McNarney will become chief executive officer of one of the nation's most diversified aircraft companies. At the present time, Convair has programs in all basic types of land and water-based aircraft—bombers, fighters, trainers and transports—plus many activities in the guided missile and other fields.

McNarney was retired by the USAF Jan. 30. He was born in 1893 and graduated from West Point in June, 1915. In April, 1917, he was given rank of "junior military aviator" by the Signal Corps Aviation School at San Diego.

In 1918 he was named director of the 2nd Corps Aeronautical School and in France that same year was flight commander of the 1st Aero Squadron in the Toul sector. In 1920 he became commander of the Air Corps Tactical School at Langley AFB, and after a four-year tour was named a member of the War Department General Staff for Military Intelligence in the Air Section.

In 1930 he became the commandant of the primary flying school at March AFB, Calif., and later the 7th Bombardment Wing. From 1933 to 1935 he was an instructor at the Army War College and from that time until 1942 he served in various top Air Corps posts in the United States.

$74 Million Asked In NACA Budget

National Advisory Committee for Aeronautics is asking Congress for an increased 1953 fiscal year budget of $74 million to step up its program from the $62 million allocated for the current fiscal year which ends next June 30.

Of NACA's 1953 budget request, $54.3 million is earmarked for salaries and expenses, providing for an increase in its personnel from 7,602 this year to 8,260.

The remaining $19.7 million is for construction:

- Langley Laboratory, $8.9 million for conversion of the 19-ft. pressure tunnel for dynamic model testing; and $4.1 million for a high-temperature structural research laboratory to investigate the problem of loss of structural integrity due to air friction on structural parts under very high-speed flight conditions.
- Lewis Laboratory, $1.6 million to increase the capacity of the high-pressure air supply and distribution system; and $4.9 million for expansion of air facilities for full-scale jet engine research.

Air Taxi Plans

National Air Taxi Conference plans a drive to increase coverage of the U.S. from its present concentration largely in the East, according to a progress report given the conference annual meeting by its president, Robert S. Northington.

Douglas to Build RB-66 at Chicago

The Munitions Board has re-assigned Air Force Plant No. 8 at Orchard Park, Ill., located on O'Hare International Airport near Chicago, to the Douglas Aircraft Company. Air Materiel Command simultaneously has frozen all machine tooling assembled there by the Fairchild Engine and Airplane Corp. for C-119 production. Instead, Douglas will use the plant in manufacture of the RB-66 twin-jet light bomber.

The RB-66 is modified version of the Navy A3D sweptwing twin-jet light bomber. It will be the heaviest and fastest carrier-borne bomber in the Naval Air fleet. While neither service will release specifications of the new USAF-Navy tactical bomber, it is said to be roughly comparable in size to the Martin B-51 which has a 55-ft. wing spread and 80-ft. length.

Navy A3D will be powered by two Westinghouse J40 turbojet engines in pods under the wings. Air Force RB-66 will be powered by General Electric J73 turbojets. Both the Westinghouse and General Electric powerplants have comparable thrust of about 9,500 lb. with afterburner.

While details of the switch in plant assignments are still wrapped in voluminous paper work at Wright AFB, Fairchild is going ahead with the removal of its personal property and Douglas is reluctantly setting up plans to return to the big, dilapidated wooden plant built at Chicago in World War II.

The RB-66 is scheduled to convert the last major USAF combat type to jet engines. The RB-66, held in very high regard by the Air Force as a tactical light bomber and by the Navy in A3D version, also is scheduled for NATO wings in Europe.

Although Navy is somewhat reluctant to discuss its production plans for its latest bomber, plans to set up twin production lines at Chicago for Air Force and Navy versions of the new twin-engine bomber are indicative of the way government and industry are attempting standardization for the national economy.

Air Lobbyists List Receipts, Expenses

Registrations of interest to aviation under the Congressional Lobbying Act, with reported expenditures for lobbying activities during 1951 and reported receipts (salary, dues, assessments) for the fourth quarter of the year, included:

Aircraft Industries Assn., 1951 expenditure: $14,435.

Air Transport Assn., 1951 expenditure: $22,032. Fourth quarter receipts: $11,300.

Assn. of American Railroads, 1951 expenditure: $237,809. Fourth quarter receipts, $49,796.

Transportation Assn. of America, 1951 expenditure: $19,184. Fourth quarter receipts: $83,740.

S. T. Tipton, Air Transport Assn., 1951 expenditure, $110. Fourth quarter receipts, $7,500.

J. Carter Fort, Assn. of American Railroads, 1951 expenditure: $508. Fourth quarter receipts: $6,343.

General Electric Co., 1951 expenditure (all in the fourth quarter): $7,353.

Harold Mosier, Glenn L. Martin Co., 1951 expenditure: $2,307. Fourth quarter receipts: $3,000.

Wayne Wershaar, Aeronautical Training Society, fourth quarter receipts: $13,200.

Larry Cates, Air Line Pilots Assn., fourth quarter receipts: $1,386.

Vernon Johnson, Lockheed Aircraft Corp., salary: $14,040 a year.

Langdon P. Marvin, advocate of the Kennedy Airmail Subsidy Separation Bill, 1951 expenditure: $985.

Clarence F. Lea, Transportation Assn. of America, 1951 expenditure: $652. Fourth quarter receipts: $1,697.

These registrants reported no expenditures or receipts:

Harry Brashear, Aircraft Industries Assn.; John C. Cone, Pan American World Airways; Avery McBee, Hill and Knowlton; DeWitt C. Ramsey, Aircraft Industries Assn.; Spence, Hotchkill, Parker, and Durvee, representing Aircraft Industries Assn. on air policy.

Correction

Figures for sales and backlogs for the helicopter industry in 1950 and 1951 inadvertently were transposed in the table on page 97 of "Inventory of Air Power," AVIATION WEEK, Feb. 25. For convenience of readers we are printing below the complete table as it should have appeared, and in the same size, so that any readers so desiring may clip this corrected table and paste it over the one appearing on page 97, Feb. 25, 1952 issue.

Helicopter Industry

	1950	1951
Sales	$15,000,000	$50,000,000
Backlog	$80,000,000	$400,000,000
Employment	c. 3,000	8,000
Plant area (sq. ft.)	600,000	1,500,000[1]
Military purchases (in fiscal years)	105	2,900[2]

[1] Including area under construction.
[2] Planned procurement in period ending June 30, 1952; units.
SOURCE: Helicopter Council of AIA.

AMERICAN HELICOPTER'S AERIAL JEEP

First photo of the XH-26 shows the midget single-seat, pulsejet-powered helicopter developed for the U. S. Army by American Helicopter Co., Los Angeles. Designated for air transportability, the new XH-26 can be stowed in 5x5x16 ft. container, chuted to the ground, and assembled by two men in 20 minutes. Its rotor-tip mounted pulsejet powerplants give the tiny copter a top speed of 80 mph. Simplicity seems to be stressed.

Get in the Scrap—Turn Yours in for Defense

Union Shops

- **That's the hot issue in new air labor demands.**
- **Wage hikes a certainty for producers, airlines.**

Both the aircraft production and airline industries are in a period of increasing pressure for higher wages and the union shop.

Higher wages are a certainty. The Wage Stabilization Board policies permit wages to rise with the cost of living and, when wage disputes come before WSB, it is recommending as much as, if not more than, the permissible ceilings.

An increase of about 25 cents an hour has been recommended by WSB for 10,000 employes of Douglas Aircraft Co.

A WSB panel has urged an increase of 14.4 cents an hour for 11,500 employes at Wright Aeronautical plants at Wood-Ridge, N. J.

The Railroad and Airline Wage Board is following WSB policies, more or less, in acting on voluntary applications for approval of airline wages.

▶**Hot Issue**—The union shop is still a subject of hot controversy. In aircraft, union shop agreements have been signed voluntarily by Glenn L. Martin and Fairchild with the CIO United Automobile Workers and by Republic Aviation with the AFL International Association of Machinists. But it is being fought stubbornly by Boeing Airplane Co., Douglas and Ryan Aeronautical in disputes before WSB.

On the airlines, impetus for a union shop is given by the Presidential Emergency Board's recommendations in favor of it in a dispute involving most of the nation's railroads and 17 non-operating railroad unions speaking for about a million employes. A major factor in this government panel's recommendation for a union shop was the fact that it is now permitted under a year-old amendment to the Railway Labor Act and a number of railroads already have signed union shop agreements.

This condition is paralleled on the airlines where four lines have signed union shop pacts—American Airlines and Pan American Airways with the CIO Transport Workers and Eastern Air Lines and Northwest Airlines with the International Association of Machinists.

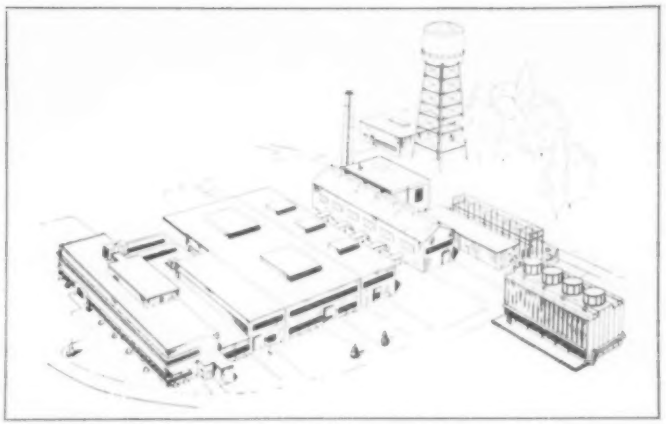
▶**Defers Action**—A union shop contract requires all employes to join the union within 30 days—60 days on airlines—and keep their dues paid up, or lose their job. Under Taft-Hartley, they can still keep their job if they are expelled from the union for any reason except non-payment of dues and initiation fee.

In the Douglas dispute, WSB made recommendations on 14 of 16 issues in dispute. It deferred taking a position on the UAW-CIO's demands for a union shop and for making the wage increase retroactive to October, 1950, instead of Sept. 5, 1951, expiration date of the agreement, as recommended by a WSB panel.

The 10,000 UAW-CIO members at the Douglas Long Beach plant have not had a wage increase since 1949. In October, 1950, the company offered a six-cent wage increase which was accepted at IAM-organized plants but was subsequently rejected by UAW-CIO.

The dispute involves employes at Long Beach as well as about 300 represented by the United Aircraft Welders of America (Ind.) at Long Beach, El Segundo and Santa Monica plants.

▶**Auto Wage Pattern**—More and more, automobile industry wage patterns are spreading in aircraft. In the Douglas case, for instance, WSB recommended automatic progression up to five cents below the maximum rate and approved a cost-of-living escalator. In the Wright Aeronautical dispute, the panel has recommended a four-cent hourly increase for higher productivity, even though neither the company nor the union—UAW-CIO—asked for it.



GE's Aircraft Gas Turbine Laboratory at Lockland, Ohio, will cost $30 million.

GE Plans Jet Research Center

The General Electric Co.'s new jet engine center at Lockland, Ohio, is to be dedicated Mar. 18 and 19, tenth anniversary of the completion of America's first jet engine.

The new facility—estimated to cost about $30 million—will be geared to research and development work on aircraft gas turbines.

GE's Lockland plant was built during World War II for the production of piston engines by Wright Aeronautical Corp. About three years ago, GE reactivated a leased portion of the plant for the assembly of J47 turbojets. The program was almost completely subcontracted to hundreds of firms throughout the country who supplied the J47 assembly line.

Then about one year ago, expansion was planned to make the plant a research, development and production center. Additional space was leased and the original leased area was purchased. Additional office and factory space was constructed.

The new area will include four joined buildings—lab annex, development accessory area, aerodynamics and mechanical building and combustion cell building. Near these buildings will be a compressor facility for air supply, with an adjacent cooling tower and power distribution center.

A Decade of Jet Progress Dinner in Cincinnati Mar. 18 will be followed next day by a dedication and inspection of the Lockland facilities, with top military and defense production officials participating in the dedication. A Jet Pioneers Dinner, Mar. 19, for men who participated in building the first U. S. jet will conclude the anniversary celebration.

Among speakers scheduled: William C. Foster, Assistant Secretary of Defense; Defense Mobilizer Charles E. Wilson; USAF Chief of Staff Gen. Hoyt S. Vandenberg; G.E. President Ralph J. Cordiner, and C. W. LaPierre, general manager of GE's Aircraft Gas Turbine division.

Branch Dykes Named Colonial President

Branch T. Dykes last week was elected president of Colonial Airlines to succeed Alfons Landa who resigned to return to his Washington, D. C. law firm.

Dykes has been with Colonial since 1941, for the past nine years as vice president-operations. Prior to that he was vice president-maintenance. Before joining Colonial, he served American Airlines for ten years in various maintenance capacities.

Landa took over a "caretaker" presidency of Colonial in June, 1951, after the Civil Aeronautics Board had preferred charges against the airline and its administration by Sigmund Janas. He said at the time that he would act as president only until situations cited by CAB had been corrected. Last week he told the carrier's board of directors that he felt his job had been completed.

► **Merger Plan**—But the most outstanding aspect of Landa's short-lived Colonial presidency was the merger agreement with National Airlines. The combined operation, according to Landa, will save nearly $1 million in indirect costs alone.

While Landa was outlining the advantages of the agreement to his directors, the merger was moving through CAB processes so fast that it appears possible to put it into effect this year. Counsel for CAB's Bureau of Operations has filed an exhibit favoring the pact; the contract between the two carriers is expected to be filed in final form this week; and Examiner Edward T. Stodola has set Apr. 14 as the tentative date on which to begin hearings.

To date, the merger has moved as fast as possible in CAB proceedings; it was consolidated into a merger investigation case already under way. If the Board believes the New England-Southern States merger case, with which it was combined, may drag after the April hearing, CAB probably will hear the National-Colonial merger case separately. At least two CAB members favor such action.

The CAB Bureau of Air Operations presently favors the National-Colonial merger over other combinations. Counsel L. G. Donahue, submitting tentative opinion for the bureau, states that a National-Colonial-Northeast merger would be more economical than a Delta-Colonial merger, even if Delta acquired the southern routes of Capital.

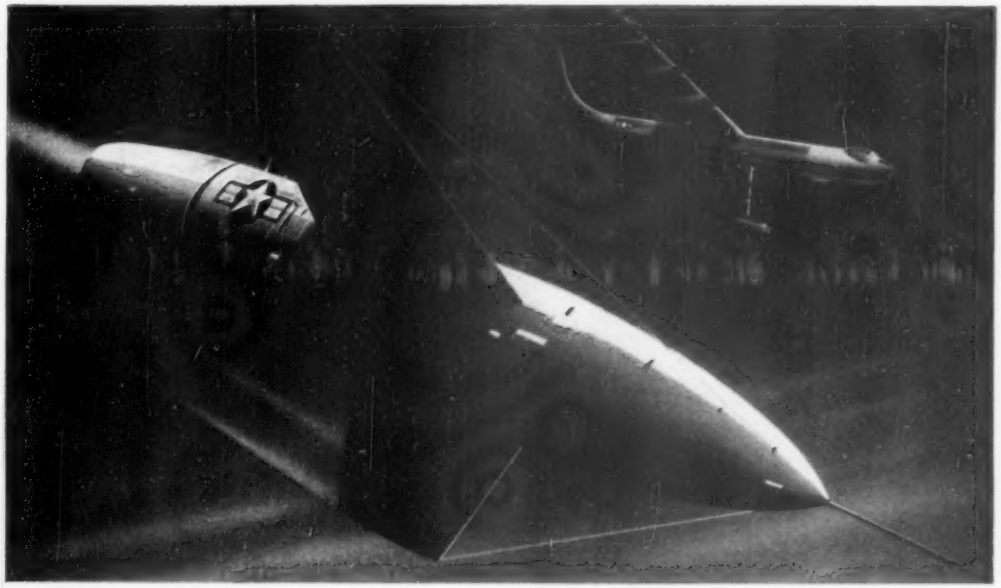
Ticket Agency Bill

Legislation giving Civil Aeronautics Board authority to clamp down on ticket agencies for unfair or deceptive practices has been introduced by Sen. Edwin Johnson, chairman of the Senate Interstate and Foreign Commerce Committee.

As with airlines, ticket agencies would be subject to fines from $100 to $5,000 for granting rebates under the measure.

THE OLD AND THE NEW IN NAVY FIGHTER STYLES

Interesting study in aircraft design progression is afforded by this first flight view of the Navy's sleek, new FJ-2 Fury flying formation with its fat, straight-wing predecessor, North American FJ-1. The FJ-1 first flew in November, 1946. Although 100 were ordered, only 30 were built; some are now flying in Reserve units. They have an Allison J35-A-4 of 4,000 lb. thrust, do approximately 550 mph. The sweptwing FJ-2 has a 5,200-lb.-plus GE J47, is over 100 mph. faster although it weighs over two tons more than the FJ-1. It is interesting to note that whereas the FJ-2's USAF Sabre counterpart has six .50-cal. machine guns, Navy is fitting its new Furies with four 20-mm. cannon. The FJ-2 is in production at North American's Columbus, Ohio facility.



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Korea: Field Test for Tactical Air Power

- **Air support of ground action is a decisive factor in modern warfare. That is broad general lesson of Korea.**
- **But Korea also has pointed up some basic requirements for development of aircraft for a bigger tactical war.**

By A. W. Jessup

(McGraw-Hill World News)

Tokyo—Air Power is the payoff power for the U.S. in tactical warfare. It will be the decisive factor in battle against either modern mechanized armies or superior numerical forces such as the Chinese Communist "hordes."

This is the broad general lesson of Korea.

Time and again, air power saved U.S. forces from defeat or provided the winning punch in battle:

• **Blunting**, then stopping the original North Korean onslaught. It enabled vastly outnumbered and overwhelmingly outarmed U. S. forces to establish and hold the Pusan Perimeter. It softened the Reds for the successful counter-offensive, the perimeter breakout and Inchon landing.

• **Holding** Chinese divisions at bay for the frozen, bloody withdrawal of the 1st Marine division from the Chosin Reservoir. It covered the retreat of UN forces into South Korea and paced the UN drive back across the Han River toward the present battle line. It slaughtered Chinese by thousands during two Red counteroffensives last spring.

• **Interdicting** Communist supply channels, apparently with success. Since last summer, the Reds, although threatening major offensive action, have launched nothing larger than regiment-sized attacks.

• **Providing** a major source of intelligence for the Army. Reconnaissance aircraft maintain continual combat patrols all across the front and deep into enemy territory, producing visual observation reports and photographic coverage for ground units. Infantry commanders complain bitterly everyday Air Force reconnaissance fails to provide full coverage of their sectors.

• **Saving** thousands of UN lives. Helicopters not only pick up pilots shot down behind the lines, but evacuate seriously wounded who probably would die if transported by other means from front line aid stations to surgical hospitals. Cargo aircraft extend the evacuation from the war zone to station and general hospitals in Japan and on to hospitals in the U.S.

• **Moving** a large volume of critical emergency supplies and troops to the front. Ammunition, guns, food and medicine are standard air transportable, expendible items. But air transport lifted and dropped or delivered bridges, trucks, construction material, construction equipment, GCA units, radar installations and practically every implement required for modern war. To a large extent this was an extension of the Berlin airlift technique to combat operations, blending the airlift with World War II Burma battle supply techniques.

The only real problem has been keeping a check rein on use of airlift. Beneficiaries on the ground continually use airlift even when more economical surface transport is available.

(Some day, military historians may conclude that proper logistic planning could have placed the Eighth Army on the banks of the Yalu River before the Chinese Communists crossed in appreciable numbers. As the Eighth Army drove north up the west half of Korea, the Tenth Corps under separate command was pulled out by ship for an amphibious landing at the east coast port of Wonsan. The logistical plan called for almost all the ocean shipping to support the Corps landing and for all cargo airlift for Eighth Army's push.

(But Wonsan harbor turned out to be the most heavily mined in history, and Tenth Corps was unable to land for almost ten days. Eighth Army had to share its airlift with Republic of Korea and other UN units which reached Wonsan by land, expecting to be resupplied by Corps, while ocean shipping waited off Wonsan while the Navy swept the harbor. This curtailed Eighth Army's supplies, and fell well behind its scheduled advance.)

▶ **Other Uses**—Air Power serves a multitude of other uses as well. Light aviation in World War II was used almost exclusively for artillery fire direction, some medical evacuation and a minimum of courier work. Now, corps and division commanders use light aircraft—Cessna L-19s, Navion L-17s and Bell H-13D helicopters—just about the way they used jeeps in World War II.

• A division commander, for example, visits his regiments and front line battalions comfortably by helicopter in a few hours, a journey would take a couple of gruelling days in a jeep.

• Staff and supply officers of all commands down to division, taxi all over by light aircraft and claim that these personal trips produce more efficient operations.

• Signal and engineer officers conduct a major portion of their reconnaissance by light plane—looking for breaks in communication lines, searching for installation sights, hunting gravel beds and routes for new roads, etc. They have laid communications lines from L-19s and helicopters.

Air Power's new heavy helicopters offer greater mobility to ground forces and perhaps eventually may change Marine assault forces from amphibious to airphibious. Limited tests by HMR 161, a Marine squadron equipped with Sikorsky HRS-1s, and the 1st Marine division have proved the practicality of helicopter transport of infantry, supplies and equipment in the battle zone.

▶ **Firepower**—Primary punch of air power, both strategic and tactical is the use of firepower—cannon, machineguns, rockets, napalm and bombs—to destroy. In its grand classical interpretation, strategic air power preserves peace by threatening to destroy an aggressor's population and economic centers. In war, strategic air power destroys an enemy's capability of waging war by destroying his production facilities and communication's network.

In Korea, application of strategic air power has been limited. The few strategic targets in North Korea, like the chemical complex at Hungnam, were wiped out by B-29 bombers in the first weeks of war. Political decisions prevented strategic bombing of Manchurian supply centers and the Russian factories from which munitions flow to the Red armies in Korea.

Medium bombers of the Strategic Air Command now are assigned to tactical missions under Far East Air Force's Bomber Command. This has been a profitable employment, illustrating the practicality of flexibility in aircraft employment, a necessity in a major war.

So Korea is primarily a tactical air war. In spite of the success of air power, Korean experiences point up basic requirements for development of aircraft, weapons and equipment for successful future employment of air power in a bigger tactical war.

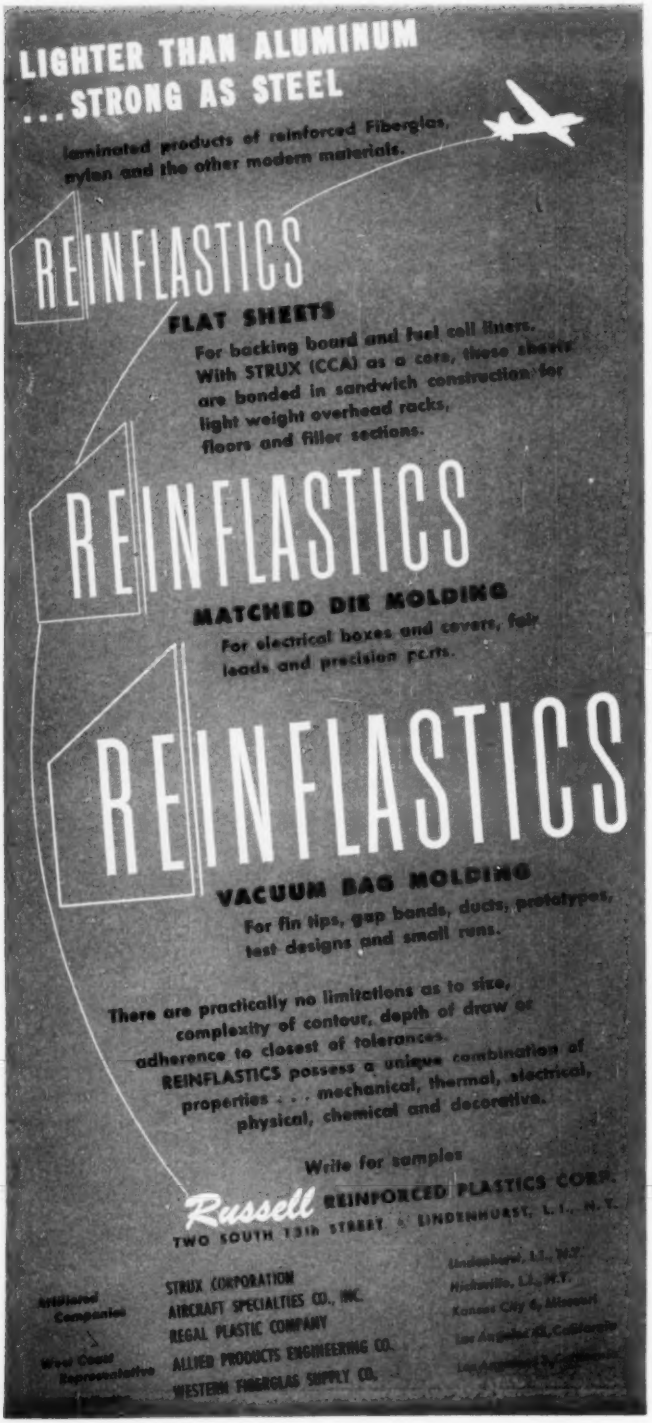
Aircraft

Aircraft breaks down into several combat headings: air superiority, fighter-bomber, bomber and reconnaissance

MiGs Blast Trademark On U.S. Planes

FLAP of B-29 (left) was badly damaged and fuselage section of an F-86 (right) ripped away by MiG fire. Both returned, as did . . .

RF-80 (left), with gaping hole in wing, and another battlescarred Sabre (right). Most damage is done by MiG 37mm cannon.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headings. After the first few days of July, 1950, F-80 Shooting Stars had driven the North Korean Air Force out of the skys. It was not until early 1951 that the Russian MiG-15 began testing jet age air-to-air combat. Since that time, the MiGs, although continually outfought by the F-86 Sabres, have convinced American air commanders that the U. S. must produce an air superiority fighter.

► **New concepts**—For a long time, it was thought the single purpose air-to-air fighter was an unnecessary luxury. This concept is gone. The combination of the F-86 and American pilotage has kept the Sabres well ahead of the MiG so far, but the gap is narrowing; there's no question that plane for plane the MiG is about as good as the F-86 and in some respects better.

However, the U. S. probably can get another three years' superiority out of the Sabre by increasing its thrust and cutting down its weight.

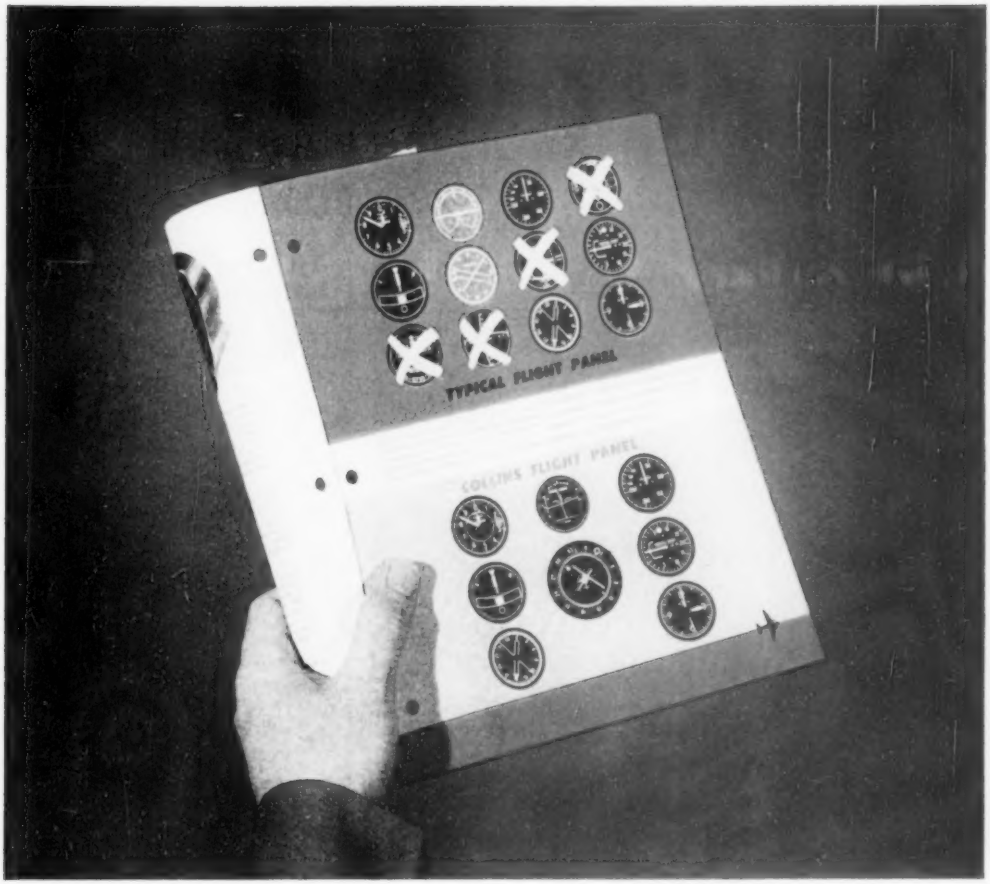
North American engineers are studying how to increase the power plant in the present design. But experienced F-86 combat pilots believe close to 2,500 lb. of equipment can be stripped out as well. As one put it, "We have got to stop building training aircraft and start making combat airplanes." A lot of the safety features for peacetime flying become combat hazards by adding to airframe weight.

Not much can be done about the F-86s now on the firing line, but it is believed possible to knock out the weight extras on those airplanes coming off the production line. A new version of the F-86 is reportedly coming out soon with double the thrust of the first Sabres used in Korea, but the weight is also double, insuring that the new plane won't be any faster.

► **MiG vs. Zero**—To those who discount the need for cutting down weight, by comparing the MiG to the light weight Japanese Zero, the "you-know-how-flimsy-it-was" school, pilots point out that the MiG is no Zero. The Commie pilot is protected by armor plate, he has an ejection seat, and he has an airplane that maneuvers well at high speed. Sabre pilots admit seeing MiGs come apart in the air—at speeds above 800 mph.!

Gun camera film from one Sabre shows a MiG pulling away, making two snap rolls, and a split S without trouble. The Sabre was right on its Mach at the time.

Another air superiority requirement is pilot training. The U. S. has to train combat pilots to fly on the Mach rather than teach them never to fly on the Mach. Air-to-air combat in MiG alley starts out at speeds over the Mach red line on the Sabre, "and we don't slow down to the red line until the battle's over." Pilots can't worry about struc-



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tinal factors. They would rather come back alive in a sprung airplane.

▶**High Performance**—Fighter-bombers are a must for tactical air war. This requires a high performance airplane. Unfortunately, some early Air Force publicity about "living in the air" led to misinterpretation. High performance aircraft is required not just to enable pilot to live and protect himself in the air, but so he can carry out offensive missions against ground targets, again and again without prohibitive aircraft losses.

The advent of jet aircraft, for the time being at least, means complete air superiority is most unlikely. The best that can be hoped for, according to Air Force experts, is temporary local superiority for a limited period of time. But high-speed fighter-bombers can hit enemy ground targets repeatedly with sudden attacks which will be almost impossible to block.

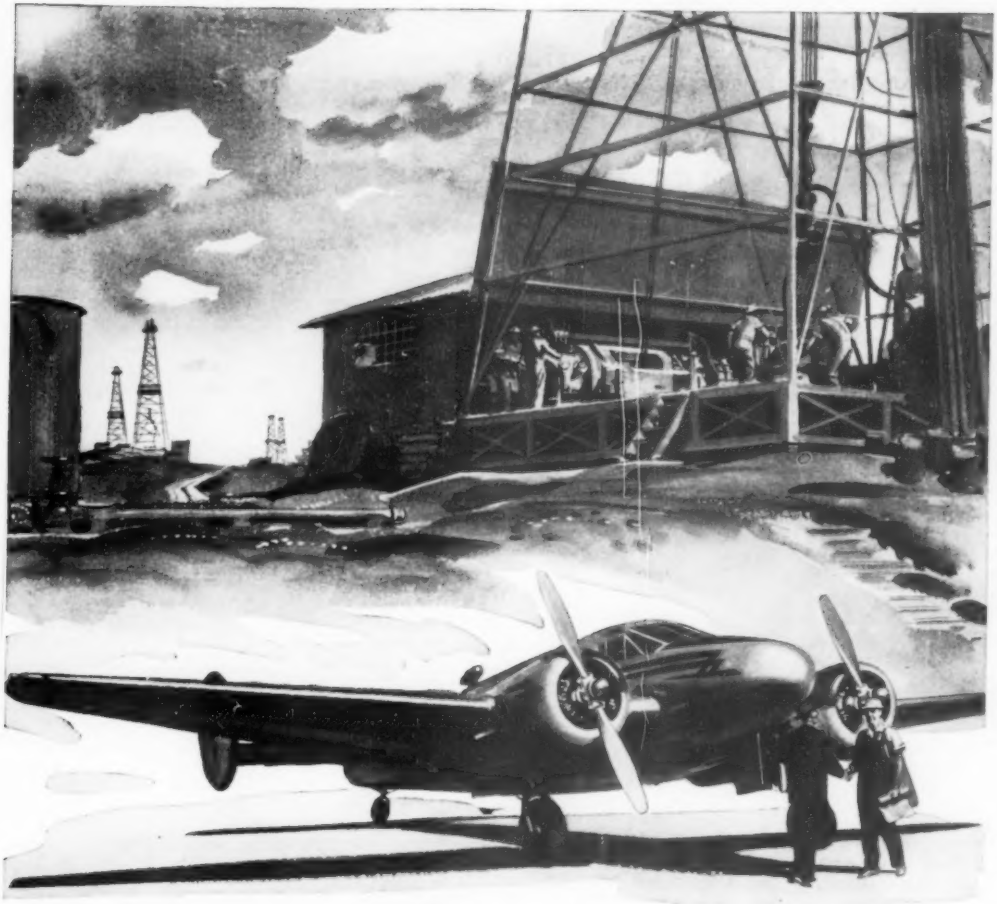
U. S. Marine Corps air trends toward this view with the support of Maj. Gen. Gerald C. Thomas, until recently commander of the 1st Marine division in Korea. U. S. Navy airmen reluctantly admit that the AD Skyraider and other slow-flying support aircraft are about washed up. The AD, without question the load-carryingest dive bomber in the business, is still doing a superb job in the Korean interdiction program; but these won't last long if and when an enemy decides to go after them with jet fighters.

And escort by defensive jets doesn't stand much chance of success against an aggressive enemy jet force.

▶**Kind Word for F-80**—The U. S. Air Force started out in Korea with the F-80 Shooting Stars for jet fighter-bombers. The F-80 performed beyond all expectations. It has operated with four 1,000-lb. bombs, taking off under 6,000 ft. using water-alcohol injection in 85-deg. heat. Other operational loads include four napalm tanks, or two 500-lb. and four 265-lb. bombs. It has taken a phenomenal amount of battle punishment as well.

The other jet fighter-bomber used is the F-84E Thunderjet. A heavier, longer-range aircraft, the Thunderjet requires considerably longer runways. To continue profitable utilization of such fighter-bombers, the U.S. soon must pay the price of an assist system. Air Force engineers are examining various systems now, including aircraft carrier catapults.

The present Thunderjets have other drawbacks. While the highly experienced pilot has little trouble making dive-bomb runs, the less-experienced find that the F-84 will run away with them with its nose down. It quickly and easily will fly through its Mach and pull apart. Today, a lot of the bombs dropped in the interdiction program



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against Communist railroad lines are released around 5,000 ft. This is responsible in part for the low efficiency of the fighter-bomber attacks.

► **Too Much Gear**—F9F-2 Panther jets are getting a fighter-bomber workout by the Navy and the Marines. Both are more than satisfied with the performance so far. But, like the Air Force, the Navy also loads down its aircraft. The F9F-5 is coming along with more power than the -2, but so much gear has been added that the final performance is about the same as that of its predecessor.

Medium and light bombers, B-29s and B-26s, contributed mightily to the Korean campaign. But replacements are a must. The untried Canberra and B-47's are considered the best candidates to take over.

For reconnaissance, Fifth Air Force's 67th Tactical Reconnaissance Wing Operates RF-80s, RF-51s and RB-26s, none of which meets the basic requirements of reconnaissance doctrine, which specifies that unarmed reconnaissance aircraft should be the fastest of their type. RF-80s conduct the bulk of photographic missions deep beyond the battle line, with RF-51s handling the visual observation on the front lines. RF-80s besides being a couple of hundred miles per hour slower than the MiGs, have to slow down below 200 mph. when making photo runs because the camera equipment designed for use in the P-38 is too slow.

An RF-86 is in the works, but its camera bay will not take the big cameras required for photo interpretation work. This may be a limitation for the RF-84F as well.

► **Limitations**—RB-26s recently completed over 5,000 night missions in Korea without loss over the target. Limitations of the RB-26 are lack of hot wing for flying through weather, slow speed and lack of all-weather capabilities.

"We are learning again what we learned in Europe," says Lt. Gen. O. P. Weyland, commander of the Far East Air Force, "that night and ill weather operations are an essential in tactical air war. When we are winning to beat the band, the other guy is forced to operate at night or in bad weather. If the other guy is a little better, then we have to work at night for protection.

"Take our medium bomber experience in Korea for example. We got into night operations with the B-29s because the enemy had an excellent day superiority fighter. He doesn't yet have an all-weather capability so we are getting a free ride and doing as well as we were in daylight."

"Not only are we putting a lot more effort in all around night operations than we were at the beginning of the Korean conflict," states Weyland, "but

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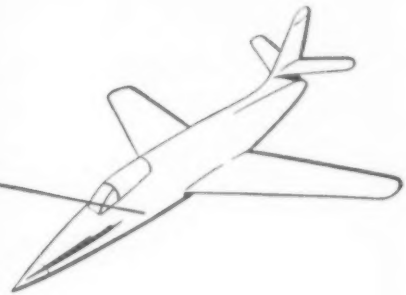
where it counts

most today



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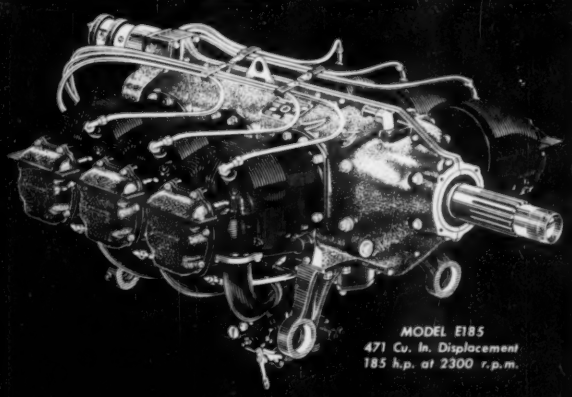

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we are doing more than at the end of the last war in Europe."

But there is a long way to go. High performance night aircraft must have a top priority, Weyland indicates. The U. S., also, requires improved night photographic methods. A method is needed for picking up night targets without normal illumination. RB-26s and B-26s spot night targets either by running lights, by moonlight or in the glare of flares.

Armament

Weapons research and development is being spurred as a result of Korea. Everything that has been used so far on a regular basis are hand-downs from World War II, and most is Ordnance Department equipment not designed for aircraft.

Jet speeds require better armament, including guns, bombs and rockets. For air-to-air a cannon is preferred, providing it has a high rate of fire. Sabre pilots would swap their six .50cal. machineguns for four 20mm. cannon firing 1,000 rounds per min. Bomb ballistics need improvement for dropping from high speed fighter-bombers, according to the men who fly them.

A top priority with the Marines as well as the Air Force is effective air-to-ground rocket for tanks. Neither the 5-in. World War II rocket nor the recently Navy-designed HVAR are of much use. But an Oerlikon rocket tested in Korea shows up well. It's a high velocity weapon requiring only a limited depression correction for air-to-ground firing. Its shaped charge packs a tremendous wallop with a minimum amount of explosive.

Equipment

Equipment lessons for Korea reflect largely the necessity of designing for mobility. Tactical mobility requires much more than just putting wheels under a ten-ton van full of gear. There is hardly an item of equipment from radar units to power generators to ammunition dollies that can be transported easily in a mobile tactical operation. Radar and communications gear must be compact and packaged in units of not more than 400 lb. which can be carried by a few men. Too much equipment is designed with U. S. highways and airfields in mind and practically none considers the completely opposite conditions in the combat zone.

In summation, Weyland says, "The U. S. must build its air power to meet the worst possible threat." While we must not build on Korea, Weyland believes the experiences of Korea are valuable guides in shaping an air force with maximum flexibility to meet any threat.

for example, the
MARTIN P5M-1 MARLIN
on the assembly line of Glenn L. Martin Company Baltimore, Maryland

Designed especially for searching out and killing the undersea raiders, the Martin Marlin is the first post-war, twin-engine flying boat developed for the Navy. This successor to the famed gull-winged Martin can also be used as a cargo carrier, air-sea rescue or general utility airplane.

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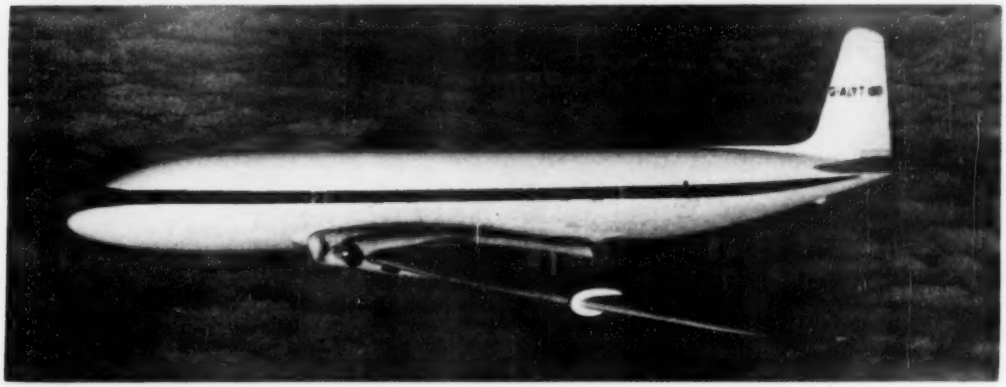


FIRST AVON COMET, shown on recent maiden flight, differs only in minor points from standard Series 1 Comet. Power is from four Rolls-Royce Avon turbojets, which necessitated revision of engine nacelles. Range is increased.

Comet Engineering Gamble Nears Payoff

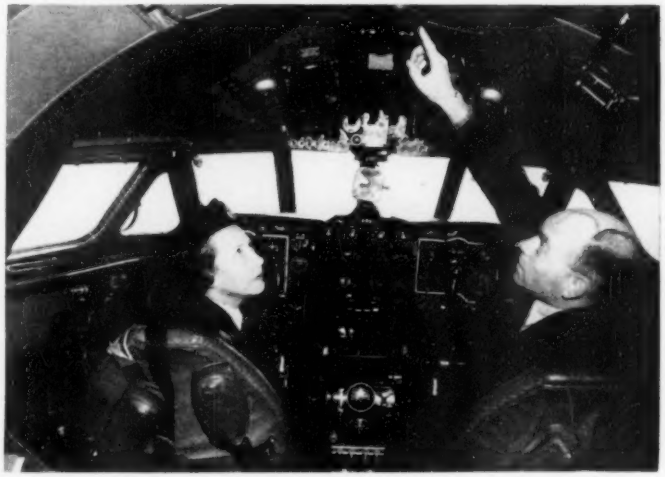
- **Need has been met for new operating methods.**
- **And BOAC will test them soon in service.**

This spring should see the payoff on one of the biggest gambles in aviation history—the development of the de Havilland Comet.

Starting in a matter of weeks, the big four-jet transport should be blasting its way toward South Africa. There's a lot of money riding on the sleek nose of the Comet. More than just another new transport, the Comet is a new conception in air travel. For DH, it is a proud achievement. For British Overseas Airways Corp., it is a bright promise. And for the airline operators of the world, it is a challenge.

If the Comet should be a disappointment, it would be a great setback to British aviation as a whole. The entire responsibility for proving the rightness of the design now rests with BOAC and its crews and operating methods.

New methods have been under development for some time now, waiting for the arrival of the Comet. Here is a summary of the more important operational procedures and flight characteristics of the Comet, the world's most modern airliner.



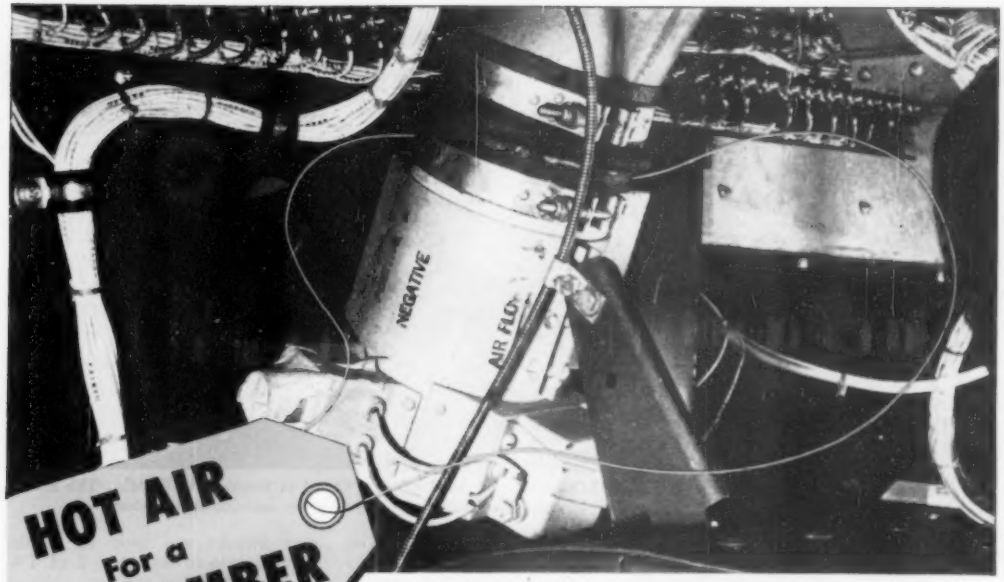
COMET COCKPIT gets once-over from BOAC stewardess as part of familiarization and crew training for this basically different airliner.

► **Ground Handling**—The proximity of the paired jets to each side of the fuselage indicates a lack of turning moment which reduces ground maneuverability, but the cleanness of the aircraft enables it to taxi for a much greater distance on one application of power than piston craft. With the bogie undercarriage, which is standard on all production models, 16 brakes (two to each wheel) are provided, so that after landing, speed can be rapidly reduced and the aircraft taxied on the energy remaining.

Approach speeds are not high, even at the maximum landing weight of 80,000 lb., and generous flap area with a nose-up attitude enables the aircraft to lose speed for the touchdown fairly rapidly.

From a standing start, the four Ghost turbojets have to be opened to almost full power, so that once the aircraft commences to roll, it should keep going until lined up for take-off. Stopping and starting involves a very heavy fuel penalty.

The suggestion that tractors be used



HOT AIR For a HOT BOMBER from JOY AXIVANE AIRCRAFT FANS

The Boeing B-47 travels at altitudes where the temperature is somewhat less than balmy. Since the cabin is pressurized, the pilot wears no mask. Unless prevented, the moisture in his breath would quickly condense and freeze on the plexiglass windshield and canopy leaving him with no vision at all.

Boeing engineers installed a Joy AXIVANE aircraft fan, with integral heating unit, behind the instrument panel. Hot, dry air, blown through a Y-duct to both sides of the windshield, prevents frost at any altitude. It also eliminates the forming of windshield fog upon rapid descent into warm air.

This AXIVANE fan, standard on all B-47 bombers, is only 3½" in diameter and 6¾" long, and weighs a scant 5 pounds, yet it produces 60 CFM at 5" W.G. Heater rating is 1500 watts at 27 volts. For safety, the heating element is thermostatically protected. A & N design specifications throughout.

WAD A 4043

● Joy designs and builds each fan to the exact requirements for which it is intended. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes stock fans can be supplied from the extensive line already designed. Both single and two-stage units available. Optional features include straight or flared inlets, beaded or flanged connections, radio noise-filters, anodization, and cooled motors where required.

★ ★ ★ ★ ★

Here are some of the many uses for Joy AXIVANE Aircraft Fans: Windshield de-frosting, windshield or wing de-icing, cabin heating, cabin ventilating, cockpit heating, cooling radio and electronic equipment, cooling voltage regulators, oil cooling, gear-box cooling, instrument cooling, air recirculation, and high-altitude pressurizer boosting.

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STEWARDESS enters forward cabin of Comet as furnished to BOAC. This section accommodates eight passengers; remaining 28 are in main cabin immediately aft.

for towing overlooks the fact that those vehicles themselves raise added airfield control problems. But haulage clear of the loading apron may prove feasible, enabling the Comet to start with a clear unobstructed run. Alternatively, a special area may be set aside for jets, allowing ample space for the initial runup. Clearance from ramp to takeoff is necessary, as idling burns kerosene at the rate of 70 lb. per min. The operator cannot afford to watch his payload or range melt away at the end of the runway while waiting for final takeoff clearance.

The danger from exhaust blast and fire has been overstressed, for by the time the exhaust gases reach the ground, their temperature is down to about 160F. Apart from the smell of kerosene and the much-higher outside noise level, the jet aircraft is no more dangerous or uncomfortable than the propeller plane.

▶**Weather Forecasting**—Outside the Americas and Western Europe, the network of upper air observation stations is attenuated or even non-existent, and the forecasting of upper winds and temperatures at altitudes required by the Comet is of a poor standard of accuracy. Despite the lessened effect of head and tail winds, in relation to air speed, wind effect is still critical. A ten-knot wind over 1,500-mi. distance adds 500 lb. to the fuel requirement.

On the other hand, a 15-deg. rise in temperature must occur to require the same additional fuel.

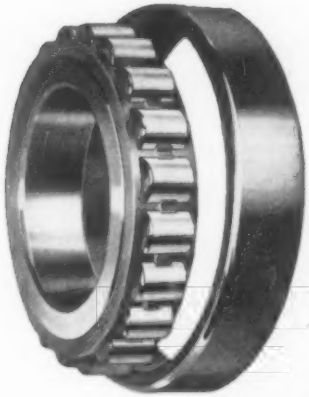
This is against the run of expectations. Temperature was at one time believed to be a critical factor, but it has been found that while high temperatures do enforce lower operating altitudes and lower air speeds, range is reduced less than ¼ of 1% per degree.

The Comet itself will help solve the problems it poses, by regular high-altitude operation and the collection of upper air data over a wide area, including data on jet air streams. These phenomena are likely to be of greater importance to the Comet than to present piston aircraft, but, unless lying along the flight path, will be rapidly crossed at the aircraft's high cruising speed.

Jet streams coincidental with the course must either be accepted or avoided by a change of altitude or of track, both involving increased fuel consumption. A feature of jet operation is that, depending on outside air temperature, and instantaneous gross weight, only one cruising altitude is possible if fuel consumption is to be kept within economic limits.

The layout of the flight forecast will probably require modification. Instead of the present pictorial cross section covering the entire route, a series of cross-sections of weather on the climb and descent at main and alternate airfields will be of more value. A verbal or written description of enroute conditions should suffice, as low and medium cloud are of little significance to high-altitude flight. Terminal temperatures are required to calculate the landing weight, and takeoff weights are similarly restricted by high temperatures.

▶**Icing**—The Comet, cruising well above normal icing levels, must still contend with icing on the climb and descent, or in the event of enforced low-altitude operation due to the loss of an engine. The aircraft is fitted



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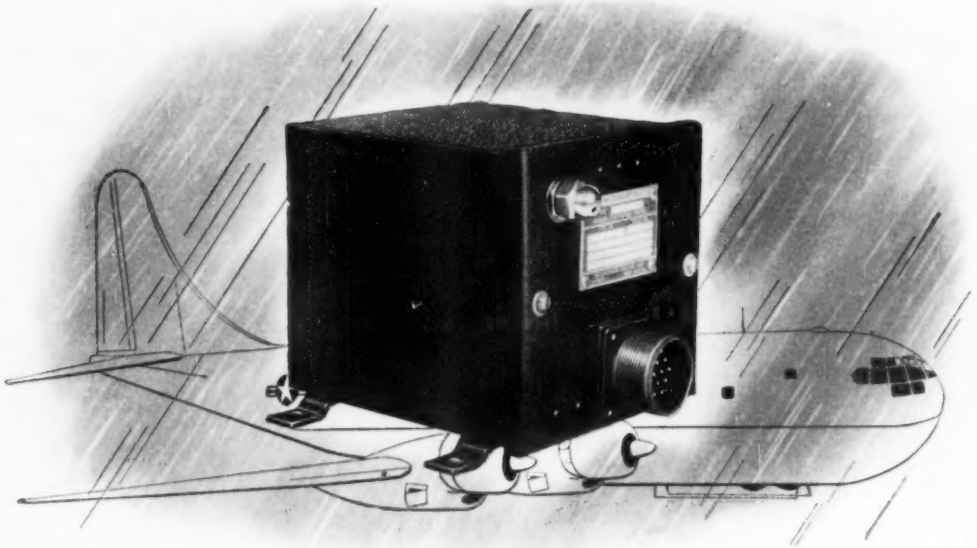

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AVIATION EQUIPMENT

with thermal de-icing, hot air being tapped from behind the compressors of the four Ghost turbines and led along the leading edge of tail and wing through perforated Fiberglas ducts.

A climb through 10,000 ft. of altitude with the equipment in operation adds 300 lb. to the fuel consumed, and 1,000 lb. is necessary on the descent. This difference is due to the low engine speed used on letdown, which does not provide sufficient warm air for the efficient operation of the system. Power has to be increased above that normally used, to step up the volume of hot air.

With a rate of climb of 2,000 fpm., time within icing layers should not exceed five minutes. Such a rate of climb is not effected at the expense of passenger comfort, for in normal operation, floor angles between plus six and minus four degrees are never exceeded. Normally then, the presence of icing conditions should not affect the operation of the Comet as much as they do more conventional aircraft.

Heavy clear, or glaze ice can still become dangerous over a 5-min. period, but by operating at a level below the icing layer for a short period and then climbing, the time within the icing belt may be appreciably shortened. Again, due to the high forward speed, skin temperatures may be as much as 75F higher than the outside air temperature.

▶**Route Application**—The Ghost-engined Comet, Series 1A, has a takeoff weight limited to 110,000 lb. and empty weight (furnished for 36 passengers) of some 46,500 lb. Allowing for crew, oil, water, pantry, etc., the basic weight of the aircraft equipped for service but without load or fuel is approximately 49,000 lb. With a designed load of 12,000 lb., using 70% load factor (8,400 lb.), loaded weight is 57,400 lb. leaving 52,600 lb. available for fuel from a maximum capacity of 56,000 lb.

Takeoff burns 850 lb. of fuel, the climb 6,400 lb., the descent 1,900 lb., and circuits, approach and taxiing 3,250 lb.

Allow 2,000 lb. to cover use of de-icing equipment, temperature and wind variations and a further 500 lb. as unusable fuel. Fifteen-minutes standoff requires 2,150 lb.; a diversion to an alternate 300 miles away, plus 10%, a further 4,600 lb. This total of 21,650 lb., added to the loaded weight, in round figures, is 79,000 lb., leaving 31,000 lb. for cruise at altitude. Allow a further 5% margin to cover variations in fuel flow.

At the average Comet consumption of .0677 air miles per pound, the still-air range calculates to about 2,000 mi. to which is added 368 miles gained on the climb and descent.

This rules the aircraft out as a regular trans-Atlantic aircraft, but puts it well in the medium 1,500-2,000 mile stage, dependent on load and wind components. The ocean crossings separating the American continent from Europe and the Far East would tend to restrict the operation principally within America, but even thus limited, there is a tremendous potential for the aircraft. And this ignores possible developments leading to increased range, speed and payload.

▶**Holding and Stacking**—If the Comet is to carry fuel for holding equivalent in time to piston-engined aircraft, the penalty is severe, but if the same weight of fuel is carried, then the jet is at no disadvantage economically. By throttling back two engines and descending in 5-min. steps, it has been found that fuel consumption is about 6,000 lb./hr. so that a 2,000-lb. reserve is equivalent to 20 min. in the stack. By diverting at 20,000 ft. instead of from sea level, between 1,300 and 1,400 lb. of fuel are saved, and a further 300 lb. are saved by diversion at operating altitude.

Circuit and approach burn another 1,500 lb. of fuel so that a progressive 20-min. descent in the stack, a decision to divert after an approach, and a climb back to altitude add 4,000 lb. to the fuel required, excluding holding at the alternate. Added to other reserves for diversion, icing, and unusable fuel, the total reserve approaches 11,000 lb. if all these contingencies be allowed for. However a marked reduction in stacking time could be achieved by pre-flight clearance and by transferring holding to the cruise period when the aircraft is most economically consuming fuel.

▶**ETA Adjustment**—With the high-speed range of the Comet, it is possible for the aircraft to adjust its in-flight plan to arrive over a given point at a predetermined ETA. The further the aircraft from that point, the simpler it becomes, so that it should prove possible to obtain approach clearance prior to takeoff.

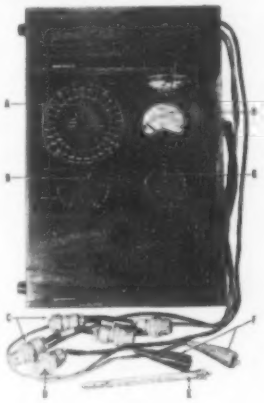
Assuming a 2,000-mi. stage distance and an average ground speed of 360 knots, the variation of speed by plus or minus five knots permits a spacing in arrival time of ten or 12 minutes.

A flight plan prepared two hours before departure indicates the anticipated ETA at the destination. This is signaled to the dispatcher with a request to obtain clearance for that time, and Air Traffic Control issues an approach clearance at, or as soon as possible after the time requested, with a tolerance either side. This is signaled back to the originating station and the departure time fixed accordingly.

For example, the flight plan of a

LEWIS

Aircraft Thermometer Testers



A Temperature selector switch
B Resistance-voltage selector switch
C Adaptors for connecting single ratiometers
D Resistance thermometer plug lead
E Liquid-in-glass thermometer
F Thermocouple thermometer clip leads
G Rheostat. H Standardizing voltmeter

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Only a few simple operations are required to test temperature indicators with these instruments. Connect the indicator under test with the plug lead or the clip leads, turn the resistance-voltage selector switch as required, adjust standardizing voltmeter to a red line by means of the rheostat and turn the temperature selector switch to the calibration points. By comparing the indicator reading with the switch setting, the scale error is determined. Liquid-in-glass thermometer is used to determine ambient temperature when setting thermocouple indicators.

MODEL 81TT9 is provided with the following calibration ranges for Thermocouple Thermometers — 0 to 1000°C chromel-alumel, minus 50 to plus 350°C iron-constantan and minus 50 to plus 350°C copper-constantan. Calibration points for ratiometer are provided for the following in centigrade —70, —50, —30, —10, 0, 10, 30, 50, 80, 100, 120 and 150, for dual or single indicators, in accordance with the AN-B-19 Curve.

MODEL 81TT5 is provided with calibration steps similar to the 81TT9, except that a range of zero to 600°F copper-constantan is substituted for the 0 to 1000°C chromel-alumel range, to provide means of checking this type of indicator found on some commercial aircraft.

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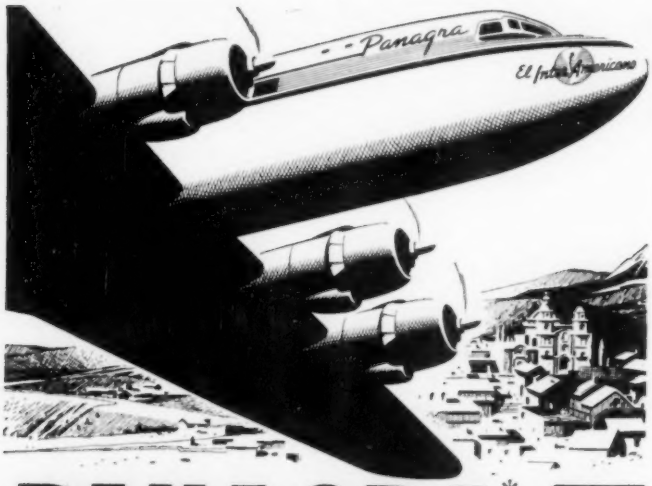

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Comet from Gander to New York is 3 hr. and ETD Gander is 0300 GMT. Gander dispatch signals New York requesting approach clearance for 0600 GMT and New York advises clearance for 0615 tolerance of three minutes, i.e. between 0612 and 0618 GMT. ETD Gander is therefore set back to 0315 and airspeed in flight is adjusted to arrive over New York at the time specified. While some allowance must be made for stacking, by this means the amount can be limited to a figure which does not affect the economy of operation to the disadvantage of the jet.

Diversion is best effected at cruising altitude, but when marginal conditions exist, the dispatcher can delay his decision until the aircraft is overhead at 20,000 ft. At this altitude, the aircraft can reduce cabin pressure to sea-level conditions and make a rapid descent for landing. Alternatively, if conditions are still prohibitive, diversion can be effected from 20,000 ft. without serious depletion of fuel reserves.

▶ **Navigational Methods**—With ground speeds of six and seven miles a minute the accuracies of navigation must be sacrificed to speed. An astro sight taking 15 minutes from intention to result is of little value if the aircraft has traveled 90 to 100 mi. in the meantime. If position can be determined within ten miles in 30 sec., this is better than position within one mile in five minutes.

With the range network available in the United States, navigation is simplified, and VOR/DME offers pinpoint navigation at a glance. For more sparsely developed areas, reliance must be placed on radio bearings and dead reckoning with the more conventional accurate methods of determining position regarded as last resort measures.

Due to the high operating altitudes, VHF range is greatly increased and much more use can be made of this facility. Radio-telegraph, while still a good standby, is slow, even at the standard speed of radio officers. One other point worthy of mention is that with the inflexibility of operating altitude (which is a direct function of instantaneous weight and temperature), vertical separation between traffic is not feasible. Air Traffic Control must devise means of lateral and longitudinal separations as the numbers of pure jet airliners in operation increase.

▶ **Route Schedules**—The speed of the Comet sets new problems in the scheduling of routes. Operating in the tropics and sub-tropics with high ground temperatures limits takeoff weights, and every endeavor must be made to time such stops for the cool hours of the day or night. Passenger convenience must be considered and while the

public appreciates it is not always possible to schedule arrival and departures at times most suited, some attempt must be made to meet public desires.

Traveling at the speed of the Comet, time zones are crossed very rapidly so that days are appreciably shortened or lengthened. There is little point in saving five hours on a schedule if the terminal is reached at 0300 local time, nor will business accrue if the departure has to be fixed at a similar hour to provide a reasonably convenient landing time.

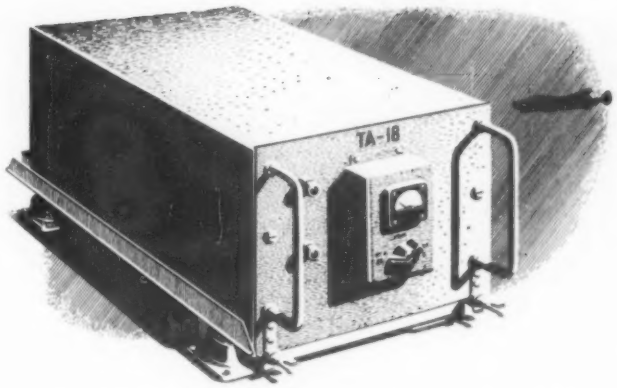
Though this is no new problem, the high speed and short duration of the Comet renders it more acute, particularly when time spent on the ground represents nearly twice the air mileage lost by piston-engined aircraft.

THRUST & DRAG

Dr. W. F. Hilton, of Armstrong Whitworth in England, says that the next design barrier is the thermal one, caused by the terrific heat generated by skin friction. (Hilton is claimed to be the man who coined the phrase "sonic barrier"—probably the most misinterpreted phrase in aeronautics. What he actually said was that near the speed of sound, drag rises suddenly "like a barrier against the future.") And he says now that Mach 2 or Mach 3 seems to be the upper limit for engines using mechanical compression of air (turbojet, for example); for ramjets, Mach 4 or 5 seems to be the stopper.

Most delayed award for wartime technical services was recently presented to Mr. William C. Heath, chief design engineer of Solar Aircraft Co. for investigations of German developments in piston and jet engines. Heath was loaned to the government as a scientific consultant (as were many others) to follow in the footsteps of troops entering Germany and to study engine ideas at Kassel, Leipzig, Dessau and Oberammergau. Most everyone else who worked in a similar capacity during the war got some kind of a citation; but Mr. Heath didn't. It's taken Army and Air Force a long time to get around to it, but finally Heath's services were recognized and he got his citation as a Christmas present in 1951.

A consulting engineer was sounding off the other day at lunch. "Do you realize," he asked, "that consulting engineering firms represent a wonderful pool of experienced manpower which probably could handle a lot of the specialized problems in the aircraft industry? And apparently nobody recognizes that, because we get very little



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business from the aircraft industry?" Well, I had always assumed that people knew that consultants were specialists, and that specialists can generally do a special job faster and more economically than general practitioners. So perhaps here is one way for the airframe and engine manufacturers to ease the shortage of experienced engineers in the design of allied equipment and components.

Test pilots will get a kick out of an early flight test report from the archives of Britain's Aeroplane and Armament Experimental Establishment. It's reproduced here from the pages of Shell Aviation News. Note: A live load of 25 stone is 350 lb.; petrol for one hour's flight should be somewhere around 10 gal.

B E 1 Certificate

This is to certify that the aeroplane B E 1 has been thoroughly tested by me, and the mean speed over a ¾ mile course with a live load of 25 stone and sufficient petrol for one hours flight is 58-59 m.p.h

The rate of rising loaded as above has been tested up to 600 ft and found to be at the rate of 185 ft per minute

The machine has been inverted and suspended from the centre and the wings loaded to three times the normal loading

On examination after this test the aeroplane showed no signs of defect

14th March 1912. South Farnborough

(Signed) S Hocksall Smith, for Superintendent, Army Aircraft Factory

SKETCH No 3

The "then and now" costs for producing aircraft are highlighted in Aircraft Industries Assn.'s publication, "Planes." Modern jet prototype, begun in 1946, cost just under $5.1 million, while World War II counterpart, smaller and less complex, but with lower performance, cost just over $600,000. And for every engineering man-hour expended on typical World War II plane, today's typical guided missile soaks up 100 engineering manhours. Other typical comparisons: Tool costs have spurted—small milling machines in 1941 went for little more than $7,000, while today's price exceeds $11,000; turret lathe figures are $3,175 against today's $8,799; and 6-ft. planer brought $8,500 in 1941, while price now is $22,800.

Porcelain enamel may help jet engine designers replace stainless steels with less critical varieties. Some corrosion-resistant enamels have been developed which will take 1,800F temperatures. And the Porcelain Enamel Institute says that these enamels are already in use on some jet engine combustion chambers, exhaust tail cones and deflector vanes. —DAA

Navy's newest sub hunter — the Martin Marlin —

uses Pittsburgh Flexseal Safety Glass exclusively

THE NAVY has ordered a "substantial number" of the new Martin P5M-1 Marlin flying boat, equipped with the latest devices for detecting and destroying submarines. The divided windshield and side panels are exclusively Pittsburgh Flexseal Safety Glass.

CONSIDERED one of the United States' most powerful anti-submarine weapons, the Martin P5M-1 Marlin presents an entirely new idea in flying boat design. Its long, sleek hull has the keel under water the entire length of the ship.

Designing this completely new airplane presented problems, including glass and glazing for the cockpit enclosure. And, as in the case of so many of America's other new planes, Pittsburgh engineers made valuable contributions.

As a result, the Glenn L. Martin Company has selected Pittsburgh Flexseal Safety Glass for the windshield and side panels of the cockpit enclosure. This contoured glass-and-plastic lamination provides the crew members with excellent all-around vision for their important mission.

Whether you are designing military or commercial aircraft, Pittsburgh will be glad to assist you with competent engineering help, as well as a complete selection of Safety Glass. Pittsburgh Plate Glass Company, 2108-2 Grant Building, Pittsburgh 19, Pa.

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SUPER CONSTELLATIONS TO GET TURBO-PROPS

The U.S. Navy has selected the new R7O-1 Super Constellation as ideally designed for vital conversion to turbo-prop power. Only minimum modifications are required, according to BuAer. No structural changes of the empennage, fuselage or basic wing are necessary.

Significance to airline operators is that Super Constellations with Wright 3250-h.p. compound engines can later be converted to turbo-props. This conversion to Pratt & Whitney T-34 Turbo Wasp engines will put the Super Constellation in the 450-mile-per-hour-class.

The Super Constellation offers any airline operator any performance he desires, from high-density coach travel, to luxury over-ocean travel, or it can be used for efficient, economical cargo purposes.

Never before has the basic structure of any aircraft provided so adequately for *growth*, assuring the operator many years of competitive performance. Compared with any of today's certificated aircraft the new Super Constellation is superior in versatility, speed, payload, range and ability to earn greater profit.

NEWS NOTES FROM LOCKHEED

Eight international airlines have now ordered Super Constellations—most recent: Seaboard & Western Airlines and Braathens S.A.F.E. Air Transport . . . With Navy and Air Force orders, the total demand now exceeds 200. . . . A new "White House Squadron" of Lockheed F-94 All Weather Jet Fighters is guarding Washington, D.C. . . . Lockheed is occupied with aircraft using six different kinds of power, including reciprocating engines, turbo-props, jets and rocket power. . . . For pilot comfort every Lockheed jet fighter has a cockpit cooling system equivalent to 100 household refrigerators. . . . The single Allison jet engine in the Lockheed T-33 jet trainer is more powerful than all four engines of the B-17 bomber of World War II fame. . . . Pilots of many nations learn jet flying in Lockheed T-33 trainers, and recently when two T-33's were delivered to Turkey they were inaugurated in preflight Mohammedan rites including a lamb sacrifice.

FROM THE WORLD PRESS

Under the headline, "New Facts on Jet Combat," *Aviation Week* reports from Tokyo: "The Lockheed F-80 (*Shooting Star*) still is considered to be the best ground-attack jet in Korea. There is considerable belief here that development of an airplane along the proved lines of the F-80 is the answer to the interdiction-close support requirement." Thus another Lockheed design continues to prove its basic "rightness" even though more modern types have replaced it in Lockheed's production line.

Highlights From IAS Conference

These digests conclude AVIATION WEEK's *presentation of subjects discussed at the 20th Annual Meeting of the Institute of the Aeronautical sciences in New York, Jan. 28-Feb. 1. Other summaries appeared previously.*

Rotary-Wing Aircraft

(Joint session in cooperation with the American Helicopter Society)

► **Correlation of Some Longitudinal Dynamic Stability Characteristics of a Bell H-13 Helicopter from Theory and Flight Tests.** Edward Seckel, Assistant Professor of Aeronautical Engineering, Princeton University.

A series of flight tests was made to determine the longitudinal dynamic stability characteristics of a Bell H-13 helicopter in forward flight. Transient responses of the helicopter to short, pulse-type, longitudinal cyclic pitch changes, were recorded. Attempts were made to correlate the period and the damping of the long-period oscillations with theoretical predictions.

The equations of motion are shown, and the many assumptions involved are discussed in some detail.

It appears that inability to estimate accurately the fuselage static stabilities, accounts for the disagreements between the observed and calculated characteristics.

A program for further tests, to obtain a better evaluation of the theory, is suggested. This would involve measurement of the fuselage static stability parameters in flight by a series of steady state tests.

Meteorology

(Joint session in cooperation with the American Meteorological Society)

► **Criteria for the Design, Assessment and Control of Ice Protection Systems.** D. Fraser and E. H. Bowler, National Aeronautical Establishment, and K. G. Pettit, Meteorological Service, Canada.

Icing parameters can be divided into two broad groups—"severity," which affects the design, and "distribution," which affects the operation of an aircraft.

The influence of each parameter on various systems of ice protection and on aircraft operation is considered. From this, it is possible to select maximum design conditions.

Practical considerations may prevent designing to these maximum conditions, therefore a simple method is presented of assessing any new or existing protective system in terms of the statistical probability of encountering icing severities which exceed the design limit. Quantitative data on icing severity obtained to date are presented.

Operational requirements are shown, from which it is evident that considerable economic advantage can be obtained by controlling the degree of protection to suit ambient icing conditions.

The need for more statistical icing data is stressed, and practical schemes are presented for collecting this data on a large scale, using simple and serviceable instruments. The possibility of regulating protection also depends on such instruments. A short discussion of existing research and operational instruments and their use establishes that suitable instruments are available.

It is concluded that preliminary design and operational requirements can be stated, that an assessment of the "ice-worthiness" of existing protection can be made, that the control of protective systems is necessary and that more icing data is still required.

The Forecasting of Aircraft Condensation Trails. Herbert S. Appleman and Lt. Col. Robert C. Bundgaard, Scientific Services Directorate, Hdqs., Air Weather Services, Andrews A.F.B.

This paper defines the meteorological state of the atmosphere which will give rise to the formation of condensation trails (contrails) as the exhaust from an aircraft engine mixes with and saturates the environment. Three basic assumptions were made with regard to the formation of visible contrails: (1) water vapor cannot be transformed into ice without first passing through the liquid phase, thus necessitating an intermediate state of saturation with respect to water; (2) at very low temperatures (such as −30 to −50C.) water droplets pass almost instantaneously from the liquid to the solid phase; (3) a visible (solid) water content of 0.004 gm/m³ is required for a trail of faint visibility and 0.01 gm/m³ for a trail of distinct visibility. This last requirement proved of no importance in determining whether or not a trail would form, but plays a definite part in determining the persistence of the trail.

Curves were constructed showing the temperature necessary for the formation of a visible trail as a function of pressure (P) and the amount of the mixture between the entrained environment and the exhaust (N).

These curves are applicable to any aircraft whose exhaust contains the same water vapor/heat ratio as the case discussed in this report. In general this ratio is fairly constant regardless of the type of aircraft or control settings.

The value of N is a function of several variables, one of which is distance behind the aircraft, thus enabling an estimate of the length of the trails.

► **Some Practical Experience of Civil Jet Transport Operations, and Associated Meteorological Problems.** A. C. Campbell Orde, Operations Development Director, British Overseas Airway Corp.

The influence of meteorological factors upon the overall economy of operation of jet aircraft is accentuated both in the project or planning stage and in airline operating procedures. The relative importance of different methods for determining fuel reserves is discussed.

On typical long-haul operations the effect of the greatly increased operating speeds and cruising altitudes of jet aircraft places new demands upon meteorological services and associated communication.

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AMERICA'S LEADING AIRLINE

BOAC with a Comet 1 during their recent development flying program on overseas routes is described.

▶ **A Meteorological Analysis of Reports of Turbulence Encountered by Aircraft in Clear Air.** Conrad P. Mook, U. S. Weather Bureau Forecast Center, Washington National Airport.

In response to a questionnaire sponsored by the NACA and the U. S. Weather Bureau, a large number of replies was received during the past year describing the nature of the turbulence and the time and place in which it was encountered in clear air. An analysis of these replies reveals that marked vertical wind shear is usually present at the time that the aircraft encounters the bumpiness or jolt.

The bumpiness encountered in the jet stream appears to be similar to that encountered by aircraft at lower levels while descending through an inversion or other type of shear zone, and it is suggested that such turbulence is partially a function of the speed, heading, and rate of climb of the aircraft through its rapidly changing environment.

It is then proposed (following K. O. Lange) that the resulting rapid changes in air speed produce changes in lift which along with vertical gusts result in turbulence. A similar mechanism is proposed for the sudden jolt which is sometimes encountered in clear air in a passage through a sharp horizontal shear zone.

Transport Safety

(In cooperation with the Daniel and Florence Guggenheim Aviation Safety Center at Cornell University)

▶ **Safety in Design.** Sidney Berman, Directorate of Flight Safety Research, Norton A.F.B.

This paper briefly outlines the organization under the command of the Deputy Inspector General, Major General Victor E. Bertrandias. It then, in greater detail, describes the functions of the four divisions within the Directorate of Flight Safety Research, followed by a discussion of instances where faulty design, inadequate analysis of specific functional problems, and/or lack of safety consciousness, were the primary causes of aircraft accidents.

The paper concludes with a recommendation that aircraft factories establish a Division of Safety Engineering on staff level. From the beginning of a prototype design, this division should work very closely with the Design Engineering division.

As the Design Engineering division's maximum effort is toward a compromise of weight and performance, so the Safety Engineering division's efforts should be toward inherent built-in safety.

▶ **Functional Cockpit Design.** Barry G. King, Medical Division, Office of Aviation Safety, Civil Aeronautics Administration.

Measurements of man provide specifications for functional cockpit design. Proper selection of values will result in a work space satisfactory for a large percent of the pilot population. Where optimal values for separate design requirements are in conflict

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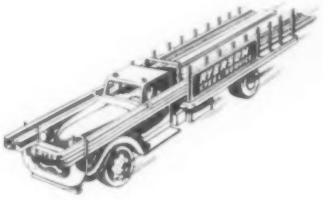

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they must be resolved to obtain an over all effective arrangement.

Since both inside and outside visibility should be judged in relation to what man can see, physiologic measurements have been made to determine the areas which can be scanned with moderate head and eye movements.

Arrangements for efficient operation of controls are determined by static and dynamic body measurements.

A stable platform of operation is necessary to ensure that the pilot can maintain his seated position with minimum effort under normal and emergency conditions. Further, protection against crash injury depends upon a "clean" cockpit and adequate restraining devices. Pilot body weights and crash accelerations which will be exceeded in only a relatively small number of crash situations determine strength requirements for seats and restraining harness.

Data are presented to provide the design engineer with some essential biological measurements.

▶ **The Airline Pilots Look at Safety.** William W. Moss, Air Line Pilots Assn., Captain, Pan-American World Airways, Inc.

The pilots' viewpoint on the present status of airline safety and their viewpoint on improving it are presented.

In general it is felt that, while strides have been made in improving the safety record, there is still room for improvement. It appears that airline safety is the result of a complex integration of many opposing factors: design, training, operational, regulatory, and human.

Immediately, the most promising areas for raising the level of safety are training and regulation, but, for the future, the conception and design of transport aircraft and the planning of operations around the human limitations of the operating crew are deemed of primary importance.

The view is expressed that the pilots, through their intimate association with the end result of all the factors influencing air line safety, can make valuable contributions to its improvement.

Rocket Propulsion

(Joint session in cooperation with the American Rocket Society)

▶ **Range Formulas for Powered Aircraft.** Ralph W. Allen, North American Aviation, Inc.

Range formulas are developed for rocket airplanes which have a constant thrust power system as well as for those which follow the power-on phase with a glide stage.

A comparison between these types of flight paths for maximum range are compared with the Breguet path.

It was found that a constant thrust path was always less in range than the Breguet path, but considerably better range is obtained over the Breguet path by the glide path.

A comparison is made between the range of a rocket airplane flying a glide path and an airplane having a fuel consumption similar to an air breathing engine flying a Breguet path.

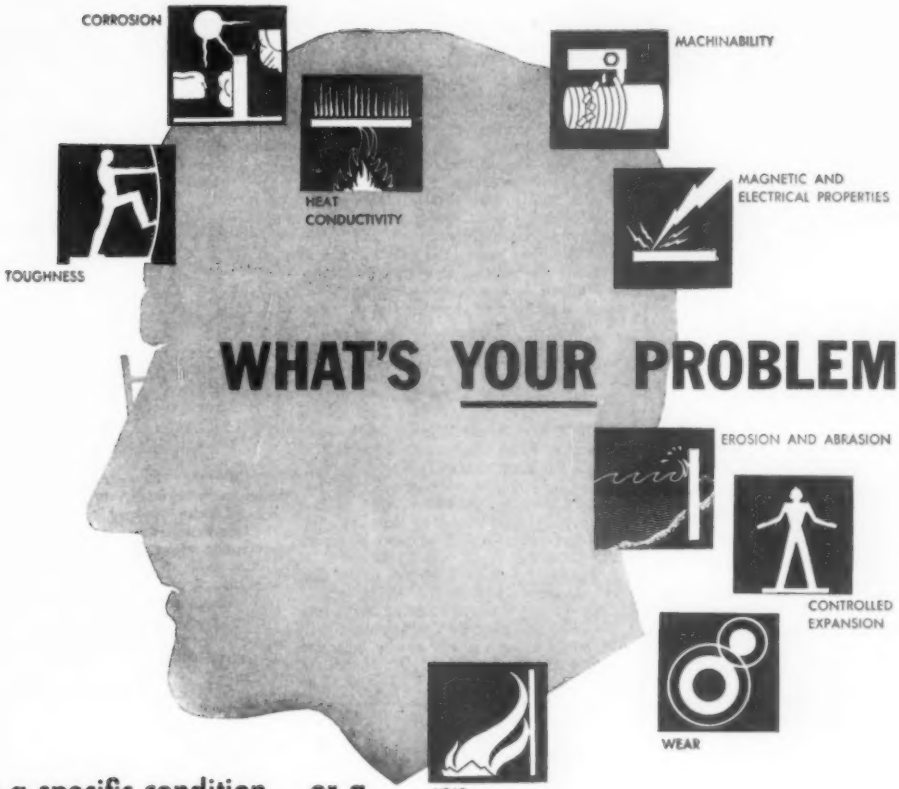
The development of the formulas along with an example calculation completes the derivation. Curves and charts showing the results and methods of calculating various types of configurations are included.

▶ **Large Scale Production and Handling of Liquid Hydrogen.** H. L. Coplen, Senior Engineer, Aerojet Engineering Corp.

A description of the techniques used and problems encountered in a rocket test program involving the large scale production and handling of liquid hydrogen is pre-

"This is Mrs. Schultz. She'd like to peek over your shoulder while you do this operation."

Douglas Airview News



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sented. The design features of a semi-commercial hydrogen liquefaction plant are described. This plant produced over 7,400 lb. of liquid hydrogen in a period of less than 6 mo. at a production rate of nearly 12 lb./hr. Methods of handling pressurization, and pumping of 100 lb. lots of liquid hydrogen in rocket test operations are also described.

On the basis of this operational experience, it is believed that the large scale production and handling of liquid hydrogen in missile fueling operations is feasible. As a result of the design experience gained in the work described herein, the design and construction of suitable liquefaction, storage, and missile fueling equipment can now be accomplished with a nominal expenditure of development funds.

Methods of minimizing the storage losses arising from the orthopara conversion are discussed. Additional research on this problem may ultimately be desired.

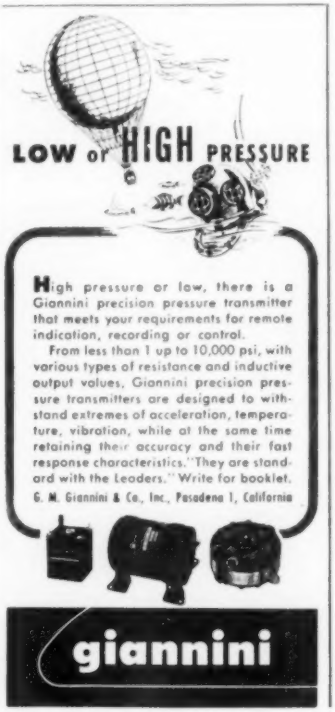
▶ **The Role of Research in Rocket Development.** P. F. Winternitz, Director of Research, Reaction Motors, Inc.

The expansion of inhabited space has become a pressing problem because of the overpopulation of the earth. Only the joint efforts of scientists and engineers can solve this problem.

The contributions of research in the past are discussed in a short historical review. Then present research activities are briefly described, and the variety of problems is illustrated. Finally, a few of the questions connected with the rockets of the future are stated, specifically those connected with interplanetary flight.

The brief survey shows that the magnitude and variety of problems require careful planning. A skeletal description of the American and international organization of rocket research is given.

In conclusion, it is stated that achievement of travel in space will create great dangers for mankind but also open the door to a brilliant future.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Turboprop Propulsion

▶ **The Highspeed Propeller.** George W. Brady, Director of Engineering, Curtiss-Wright Corp., Propeller division.

The aircraft propeller for use at transonic and high subsonic forward speeds is the result of aerodynamic and structural research carried out since World War II.

The application of tests of a number of different propeller configurations including blades with sweepback, low aspect ratio and low thickness ratio to the design of transonics and supersonic propellers is discussed.

Is is shown that good efficiency for the transonic propeller up to 0.85 Mach number and for the supersonic propeller through the transonic region and well into the supersonic region can be obtained.

Structural and allied problems are reviewed, and it is indicated that the desired aerodynamic characteristics can be obtained with a structurally satisfactory design.

Overall performance of a high output turboprop engine with both transonic and supersonic propellers is presented. Other important performance advantages of propeller propulsion such as high takeoff thrust and reserve thrust for aerodynamic braking are outlined.

▶ **The Turboprop Airplane.** W. W. Fox, Project Engineer, Consolidated Vultee Aircraft Corp.

The turboprop airplane, as we know it today, requires somewhat of a transition in thinking from the usual design characteristics of reciprocating engine powered aircraft. To date, there have been five turboprop powered planes flown in the U. S. for an approximate total accumulative flying time of 150 hr.

The operation of a turboprop airplane is, in reality, quite simple when all components function properly.

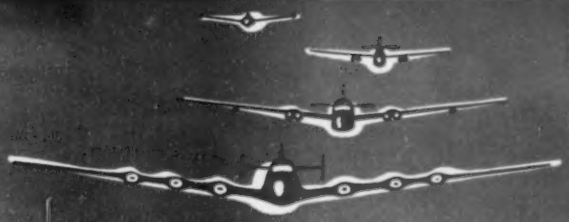
Engine run and check-out procedures are very simple, and a turboprop airplane can be put into the air in much less time than an equivalent reciprocating engine powered airplane.

Even though turboprop engines in the U. S. are in the embryo stage of development, their future appears to be quite bright.

Continued research and development will provide a type of power plant that far exceeds the capabilities of reciprocating engines and for some specific tasks the turbojet engines.

NACA Seeks Funds

NACA has asked House Armed Services Committee approval of $19.7-million budget for research on air speeds up to 1,900 mph.



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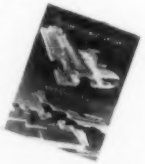

STALWART RUBBER COMPANY

200 Northfield Road • Bedford, Ohio

Titanium Forging Gets Underway

Titanium bar forgings with excellent surface finishes are now being turned out in quantity by Kropp Forge Co., Chicago, Ill. The metal is of importance to aviation because of its resistance to high temperatures.

In a recent statement, Mr. Roy A. Kropp, president, said that 14 months of the company's practical and lab research had led to the developing of techniques for titanium forging production.

He said that the design and operation of the dies used were also important factors. The difficulties encountered in forging titanium were similar to those found with stainless steel; the metal is stiff, and it has an abrasive action which hastens and increases the wear of dies. Close temperature control as well as experience are prerequisites for obtaining close tolerance work free from defects.

New and heavier hammers are now being installed by Kropp Forge because of the higher density of the metals being specified for aircraft forgings. These new hammers will increase plant capacity as well as supply the extra push required for these new forgings.

Decca Flight Log Flying in Ashton

High-altitude tests of the Decca Flight Log, short-range navigational aid which nearly covers Europe, are being currently made with the Avro Ashton flying laboratory.

Overflying the Channel Islands, turning to fly back across South Wales, the Ashton is making accuracy checks of Decca at altitudes of seven miles and up. And the aid is being used to check the Ashton's high-speed approaches in the metropolitan control zone and the airway corridors which are centered on London.

▶ **Flight Plotter**—Decca plots the flight path on a strip map display mounted on the cockpit panel. Ground stations supply intelligence to the airborne unit which computes position and controls the stylus marking the map.

For the turbojet aircraft expected soon in service, Decca has built a new airborne receiver which will accommodate flight speeds as high as 1,500 mph.

The Ashton, described in AVIATION WEEK Nov. 20, 1950, is a pressurized high-altitude job with four Rolls-Royce Nene turbojets. The particular Ashton used for these tests is based at Boscombe Down experimental airfield, and is one of six built by Avro for the Ministry of Supply.

sps aircraft fasteners

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Superior safety nuts. Sizes from ¼" to 1½".

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AIRCRAFT PRODUCTS DIVISION

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SWA Theme: Get Them in the Air Quick

• Carrier has worked out many time-saving tricks.

• Result: average ground time of 4.7 minutes.

By George L. Christian

San Francisco—Smaller airlines can have big problems. And one of the biggest jobs on Southwest Airways is pinching in ground time to a minimum so that its hop-skip-jump operation gets its passengers to destination in the "shortest time for the leastest money." Latest statistics show that SWA is doing pretty well at this—average ground time at line stations from touchdown to take-off is a speedy 4.7 min.

▶ **The Blueprint**—Here is what SWA did to its fleet of ten DC-3s to cut ground time to what may be an irreducible minimum:

• **"Air Stair" doors** were built and installed in all planes. Company spokesmen say that the rapidly operated door (which eliminates need for loading ramp) was an SWA development and that the airline holds patents on the door.

• **Forward cargo compartment** was eliminated, passenger seats moved ahead, and rear freight compartment enlarged. Result of this modification was to speed cargo loading without sacrifice in cargo space. Forward compartment was so high that loading was difficult and required some sort of stand to reach it. Rear compartment is at a handy waist height.

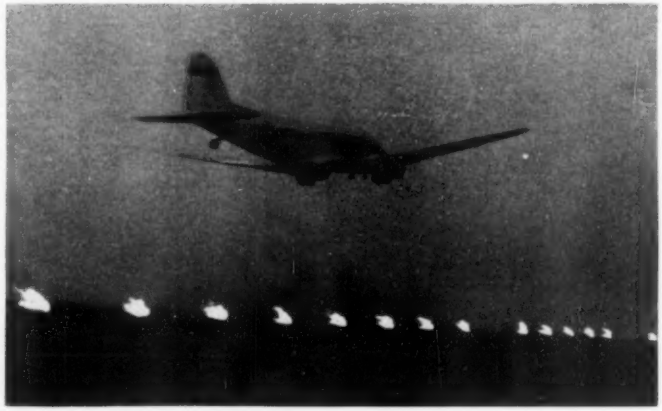
• **Rear cargo compartment** lower sill was removed and access door enlarged to speed freight handling.

• **Carry-on racks** for passenger baggage were installed in the rear of the cabin just across the aisle from the entrance door.

• **A door was cut** in the bulkhead between cabin and rear cargo compartment to permit flight attendant to enter the area in flight and segregate all freight to be unloaded at the next stop. This saves considerable time in last-minute sorting.

• **Gust locks** and landing gear pins are not used during en route station stops, saving time and manpower.

• **Right engine** is allowed to run at station stops saving the need for a battery cart and the time and man to plug it in.



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FIDO LANDING by Southwest Airways DC-3 was first by a commercial airline, the carrier claims. Here is the story the weather sequences tell: before FIDO—Airway 11, 10:45 am., weather ragged variable, showers, ceiling zero, visibility ¼ mi.; after FIDO—11:04 am., estimated ceiling 400 ft., visibility ¾ mi., fog, weather and ceiling manufactured.

• **Through-passengers** do not deplane at en route stops.

• **Rolling cockpit** checks have been worked out. Checks, including engine run up, magneto checks, etc., are performed during taxi to runway. Captain is thus ready for takeoff immediately upon reaching runway.

• **Weight and balance** is worked out by the flight attendant as plane taxies from terminal to runway. This saves the time of holding plane on the ramp while the forms are being checked and completed. (Because purser's duties can be somewhat arduous, including handling baggage, cargo and mail, SWA uses male flight attendants instead of stewardesses.)

• **A bell near the door** allows the purser to signal cockpit the instant the door is closed and the flight ready to operate.

These modifications of planes and procedures have paid off. Southwest's loading time averages 1½ min. and has occasionally been compressed into 60 sec. Fueling stops take about five minutes. Trick here, according to airline officials, is to fill one tank with two nozzles whenever possible. And when a plane lands on an average of once every 24 min. and can make a dozen stops during one trip, such scrupulous attention to speed can mean the difference between success and failure.

Pat on back for Southwest's competence came recently when the airline won a Civil Aeronautics Board's renewal of its certificate of public convenience and necessity to Sept. 30, 1954. In granting the renewal, the CAB threw in this orchid: "We cannot but take pride in the outstanding performance of (Southwest)."

▶ **More Oil**—SWA has recently installed larger capacity oil pressure pumps on its engines. Reason was to eliminate possibility of oil starvation—a situation aggravated by the comparatively high number of takeoffs the airline's DC-3s are compelled to make, according to D. Davison, director of engineering and maintenance.

Included in the modification are reworked oil tanks. The hoppers were removed and oil inlet was extended into the tank to direct oil against one of the tank's baffles. Purpose of the new inlet configuration, Davison pointed out, was to prevent oil cavitation and resultant oil starvation which occasionally existed with the small capacity hopper. Added advantage is that tanks stay cleaner because sludge formation at bottom of reservoir is inhibited by swirling motion

of oil resulting from use of the baffle. Davison suggested that the cleaner oil resulted in better propeller feathering action.

SWA planes carry 22 gal. of oil out of the main base and no less than 18 gal. back in. This additional oil (normal capacity is 16½ gal.) increases the safety factor and helps to cool the lubricant. SWA keeps close watch on its engines' oil consumption. If 5 qt./hr. is exceeded, the engine is pulled. Two powerplants have already been saved because of this procedure.

► **Radio Aids**—Southwest spokesmen claim the carrier has developed procedures, acceptable to the Civil Aeronautics Administration, for using commercial radio broadcast stations as nondirectional homing beacons. First approval, the airline says, was for its own aircraft.

"Later," says SWA, "after more than 400 instrument approaches were made on stations at five different cities without one incident wherein safety was impaired," the CAA approved the procedure for other airline use on a restricted basis.

Permission may thus be granted an airline to use a commercial broadcast station for homing after the carrier requests it and a specific radio station has been investigated to determine that its transmission is suitable to the proposed procedures, according to a CAA official.

First station to be CAA-approved, according to SWA, was KDON, Monterey, Calif. The oscillator (material cost was $40) used to transmit the KDON identification was built in Southwest's radio shop.

► **Manufactured Weather**—A "first"—SWA is proud of being the first commercial airline to operate under "manufactured weather" conditions. Airline officials say that, on Nov. 29, 1947, the "first 'manufactured weather' report clattered over CAA weather teletype circuits—resulting from a FIDO (fog disposal) clearance at the Landing Aids Experiment Station, Arcata, Calif. . . . On Dec. 14, the first scheduled air carrier (SWA) . . . used 'manufactured weather' in regular operation."

On the first landing, CAA reported the weather as "visibility ragged, variable ⅛ mile, showers, fog, ceiling zero;" 19 min. later, after FIDO had been in operation the report was revised to "visibility estimated ¾ mile, fog, ceiling 400 ft. . . ."

The carrier has made over 100 scheduled landings at the LAES field (which serves both Eureka and Arcata) using "integrated landing aids." These wrap up high intensity runway lights, FIDO, ILS and GCA. Southwest says it has distributed information gained through these experiences to the air

Now for the first time you can apply O-Rings for static installations that will retain dimensional stability indefinitely . . . O-Rings impervious to gases, oils, or aromatic mixtures . . . O-Rings that hold against pressures as high as 20,000 psi and withstand temperatures limited only by the "physicals" of the metal . . . O-Rings you can install in free machined recesses, tighten up, use indefinitely, inspect at any time and reuse regardless of age.

These U. A. P./Wills O-Rings are metallic hollow tubing filled with inert gas at 600 psi, are compressible when installed, provide metal-to-metal contact for positive permanent seals. Standard rings of stainless or mild steel cadmium or nickel plated available in experimental quantities: sizes from 1 1/16" to 40" OD in 1/16" increments. Production quantities available soon. Write for new technical bulletin No. 21252.

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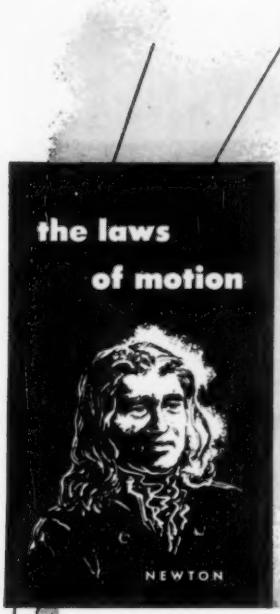

Newton's laws of motion dictate the basic design features of instruments that measure rapidly varying physical phenomena. Statham transducers are available for the measurement of acceleration, pressure, force and displacement. The transducer element, converting mechanical input to electrical output, provides the means whereby Statham instruments achieve accuracy under dynamic and static measuring conditions.

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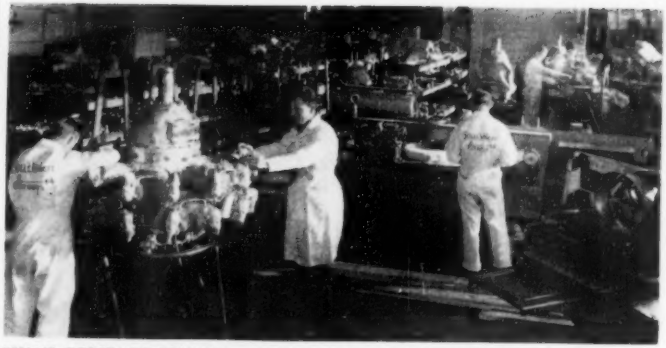


SWA'S COMPACT ENGINE overhaul shop does work for outside customers too.

LITTLE CRESCENT CITY (pop. 1,689) generated 4,000 SWA passengers last year.

transport industry for its information and guidance.

▶ **SWA Roundup**—Southwest officials said their airline could not tolerate unnecessary frill and overhead. Operation is trimmed to bare necessities. SWA supports no unneeded "brass" and there are no assistants. Its passengers fly without food service or even gum, coffee or magazines. Water is provided.

• Braking is of prime importance to a gear-up, gear-down operation like SWA's especially because of some of the short runways it uses. The airline is changing over to Goodrich heavy duty brakes (Model H-2-455). Tests run by the airline indicate that its planes should be able to make approximately 2,400 landings before replacing linings, according to Davison. He said the Goodrich units gave better braking and were cheaper to maintain. Old brake linings wore out at about 1,000 landings.

• Southwest's overhaul shops take care of all the airline's requirements (and some outside work, too) except for propellers—there is no space in the establishment to take over that activity under present circumstances. (In one corner, John Connelly, president, runs his sideline—manufacture of a model airplane engine dubbed "Thunderbird" after the SWA emblem which features the Indian device.)

• Warning flags of bright yellow are displayed at some of the smaller fields on SWA's route to alert private craft that one of the airline's flights is approaching. This allows Southwest's pilots to make straight-in approaches most of the time and avoid time-consuming go-arounds.

• The airline operates eight 28- and two 27-passenger DC-3s. The latter have nine rows of three seats giving unusually ample room for such a high-density arrangement. SWA operates 1,272 route miles, from the northern terminus Medford, Ore., to the southern, Los Angeles. Average flight takes 24 min., distance of average hop is under 80 miles. Performance factor is quoted at 97.5% and load factor at 52% for 1951. Utilization is about 6 hr.

• Pilots use a public address system to keep passengers informed of points of interest en route (one pilot reportedly tuned in the Rose Bowl game a few years ago and circled the Pasedena stadium to give his passengers a high grandstand seat view).

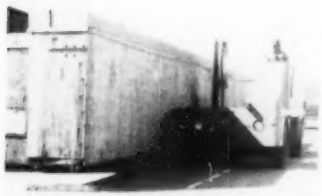
Feederline in the true sense of the word, Southwest fed over a million dollars worth of connecting traffic in 1951 to American Airlines, Pan American

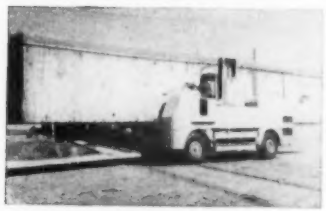
World Airways, Trans World Airlines, United Air Lines and Western Air Lines at San Francisco, Los Angeles and Medford.

It established its own non-directional radio beacons at Fort Bragg and Crescent City, Calif. to give those towns their first flights under IFR conditions.

Crescent City—a community of 1,689 population—generated some 4,000 passengers for 1951.

No major changes of route structure or operations are contemplated by the airline as a result of CAB's renewal of its certificate. Company officials told AVIATION WEEK that "although Southwest is constantly working for replacement for its DC-3s, it has no present aircraft in mind which would satisfactorily replace the DC-3 on our particular route structure."





Machine Moves Heavy, Bulky Loads

A quicker, easier way to move heavy and bulky loads has been found by personnel at Kelly Air Force Base, San Antonio, Tex.

Example of the flat-top type machine's efficiency: a single Traveloader (trade name of the machine) and one operator moved a crated section of a B-36 wing (see cut) .3 mi. in 10 min. Crate was 48 ft. long, 7 ft. high and 3 ft. wide. Weight was approximately 5,000 lb.

Air base said that former method would have required two fork lift trucks, a tractor-trailer and four or five men. And operation would have taken about four times as long to accomplish as with the Traveloader.

The Traveloader is manufactured by Lull Mfg. Co., 3612 E. 44th St., Minneapolis, Minn.

We asked 488 'Experts' to compare MICROTOMICs with the drawing pencils they were using..

94% VOTED

MICROTOMIC

MORE UNIFORM!

Our 'experts' were engineers, architects, draftsmen, purchasing agents—drawing pencil buyers and users like yourself.

The test they made was to compare the uniformity of 3 MICROTOMIC pencils of the same degree, with that of 3 same-degree pencils they were then using.

459 of them—an amazing 94% of those who made the test—picked the New MICROTOMIC Drawing Pencil as "more uniform"!

What's more, 384 of these 'experts' within a month said they either were 'already using MICROTOMICs', or intended to specify MICROTOMICs on their next pencil order!

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free! Try the against test yourself

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I'd like to test the uniformity of 3 degree MICROTOMICs vs. my present drawing pencils.

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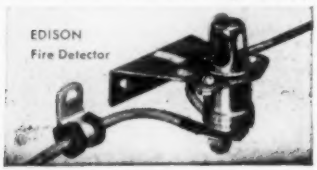

Practically every major air line in the U.S.A. depends on EDISON fire detection. Send for free Bulletin AW4A-3003.

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MANUFACTURERS OF *Electrical Resistance Bulbs, Temperature Indicating and Alarm Systems, Sealed Thermostats.*

YOU CAN ALWAYS RELY ON EDISON

Alcoa Hard Coating Licenses Available

The Aluminum Company of America has announced availability of hard coating processes, including its Alumimite process, to the industry under licensing arrangements.

Finishes provided by these methods toughen aluminum surfaces so they last longer and are less affected by the ravages of wear, abrasion, heat erosion and corrosion. Because of their increased hardness, aluminum parts sometimes can be substituted for steel parts, thus saving weight. The wear-resistant finishes are anodic oxide coatings which are integral with the metal they protect. Parts treated in this way already are extensively used in aircraft, Alcoa points out.

The company announced simultaneously that it has acquired patent rights to the Martin Hard Coating Process from the Glenn L. Martin Co. This is said to be similar to the Alummite process. The Martin method has been used successfully on parts such as gears and pinions, pistons, jack-screws, door mechanisms, turbine impeller blades, leading edges of high-speed airfoils and other assemblies.

TECO'S HI-DENSITY SEAT

This seat, made by Transport Equipment Co., comes in two basic frame dimensions, the standard width and a slightly wider version called the de luxe hi-density seat. The Burbank, Calif., manufacturer says that the seat will take up to 9Gs on aft-facing loads, is built on a lightweight, all-steel chrome-molybdenum structure, and features a friction type recline control mechanism. The latter allows passenger to select from an infinite number of recline adjustments instead of the conventional notched adjustment stop. Subframing has been simplified, and seat pockets have a new recessed inner lining to permit storage of larger packages. The seat, labeled TE-314, weighs 28 lb. for the single unit, 48 lb. for the double, and 75 lb. for the triple. Manufacturer says seat is currently going into production for Trans World Airlines' coach Constellations.

NEW

VICKERS

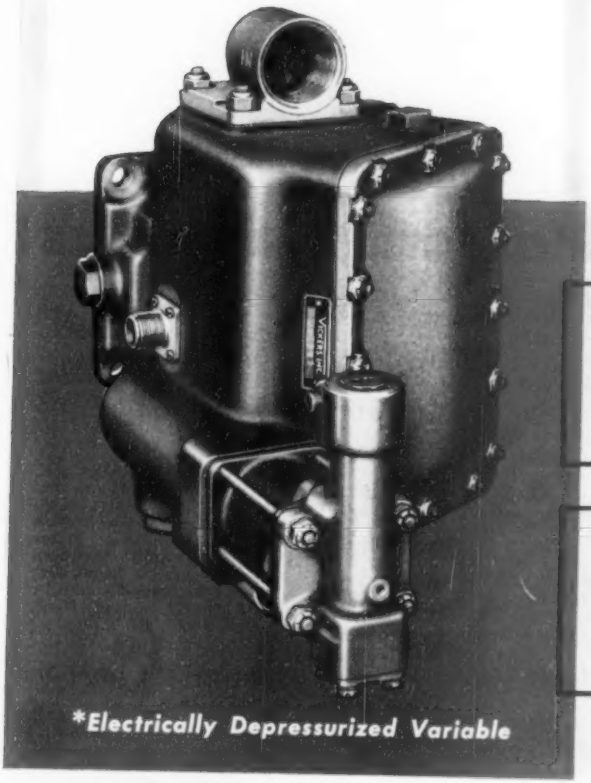
EDV* PUMP

The new Vickers EDV Pump is a variable delivery, piston type pump which automatically delivers the hydraulic fluid at rates from zero to full rated volume . . . governed by the demand of the load. In addition, an electrical control latches the pump at zero delivery and pressure when no fluid is required. The instant there is any demand, the pump automatically delivers the volume of fluid required at full pressure.

This arrangement has many advantages, particularly on long flights. In the first place, the power required by the pump in the "latched zero" position is negligible. Fuel savings in the order of 700 lb per flight have been estimated. This saving can be used to increase pay load or to extend range.

As the pump does not circulate any fluid in the "latched zero" position, if any line is damaged (e.g. by gunfire) fluid loss is confined to that line . . . the pump does not empty the reservoir.

The pump is not stopped in the "latched zero" position . . . it operates at normal speed but at no load. It is ready the instant demand occurs . . . nothing has to be brought up to speed. Other advantages are low maintenance costs and longer periods between overhauls. It can often simplify hydraulic systems. For additional information on the Vickers EDV Pump, ask for Bulletin A 5202.



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entire hydraulic system when demand ceases

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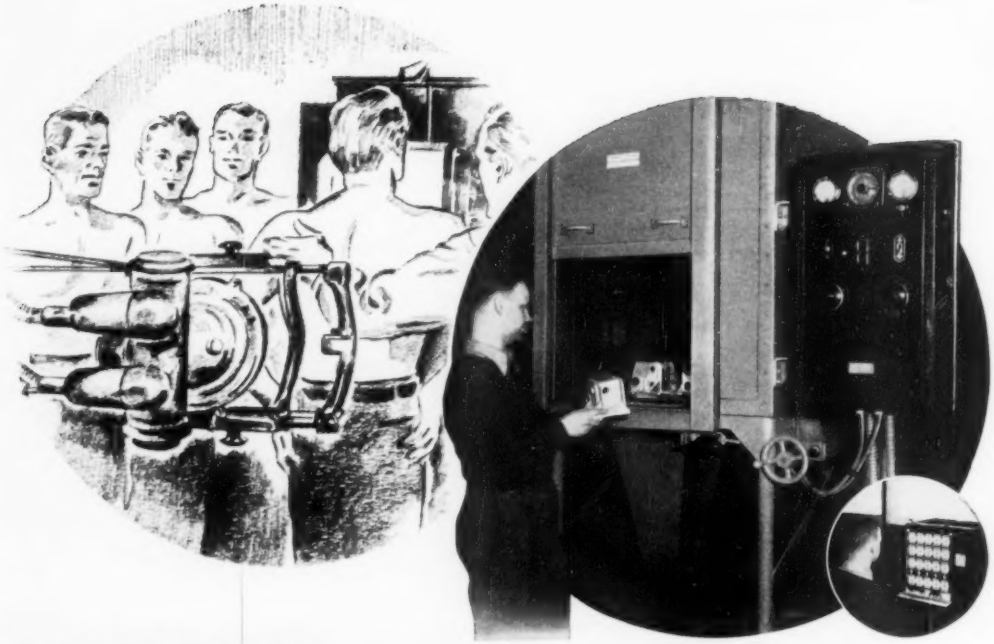

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DURING the production of your Die Casting requirements here at Parker, specially designed X-Ray equipment is frequently used to carefully check your castings. From the original planning stage through the finished castings, a 16-Point Production Control System analyzes each phase of production, thus guaranteeing that **YOUR** requirements will be met . . . exactly. For more than a half century Parker research has helped our customers obtain the finest die castings possible. Parker's X-Ray testing technique is another example of how Parker's long experience pays off for **YOU!**

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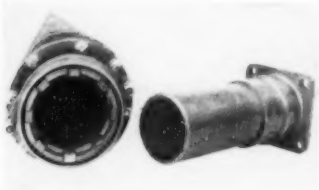
NEW AVIATION PRODUCTS



Fuel Coupling

A fuel coupling for aircraft which positively shuts off flow when it is disconnected, yet leaves the passage completely clear so there is no pressure drop when it is connected, is being produced by E. B. Wiggins Oil Tool Co.

The coupling utilizes a flapper valve to block the fuel passage when it is separated. It is eccentrically shaped to provide extra space for the flapper disc to retract so that the main fuel passage is left unobstructed when both halves of the coupling are engaged. Flapper retracts flat against wall of the unit. A spring inside the coupling snaps the flapper down into the fuel passage when the right half of the coupling is pulled away.

E. B. Wiggins Oil Tool Co., Aircraft division, 3424 E. Olympic Blvd., Los Angeles.

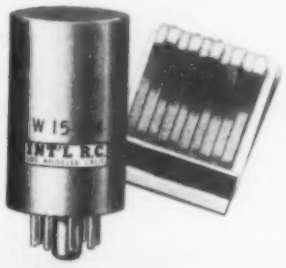
Pneumatic Valve

A check valve for use in high pressure air or nitrogen systems is the latest addition to the line of "Circle Seal" products produced by James-Pond-Clark.

The valve, 299A-4TT, operates through a pressure range from zero to 3,000 psi., is proofed to 6,000 psi. and has a burst pressure of 7,500 psi. There is no leakage through its normal operating range, says the company. And it is built to perform suitably through temperatures from –65 to 165F.

The unit provides tight sealing not only at high pressures, but at very low pressure differentials, the firm states. "O" rings furnished are AN 6290 compound, 90 durometer, molded to AN 6227 size. Softer AN 6227 compound "O" rings can be used for emergency replacement. Weighing about 1 oz., the valve conforms to AN 6249-4 in length and is made of aluminum.

James-Pond-Clark, Pasadena, Calif.



Sealed Rectifiers

A new line of hermetically sealed selenium rectifiers provided with standard tube-base terminals is available from the International Rectifier Corp. The sealed units are filled with inert gas.

The hermetic sealing offers protection against environmental conditions while also permitting quick replacement of the rectifier during maintenance.

The unit illustrated is rated at 390 v. rms.; 550 v. peak inverse; 129 ma., 160 v. d.c. output at 35C. Half wave and bridge circuits are also available.

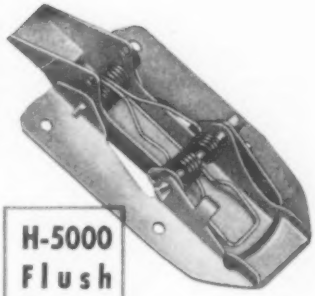
International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.

Checks Cabin Leaks

A test set designed to measure leakage rate of pressurized cabins in aircraft has been developed by Engineering Associates.

The unit is a direct reading type, and does not require skilled personnel to operate, according to the company. It is an orifice type airflow meter. Air introduced to the cabin for test purposes is controlled manually by one valve and air flow rate is indicated directly on one gage. The company emphasizes no charts, mathematical calculations, etc., are required to find leakage rate.

Sets can be supplied for a wide range of flow rates, encompassing types for checking out pressurized cockpits in fighter type aircraft. One of this latter type has a flow capacity of 12 lb./min. and includes a cabin pressure gage and canopy seal pressure regulator and gage. Units weigh about 30 lb.



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The planes shown above are typical designs that incorporate Aerotec Automatic Controls. The Republic F-84F Thunderjet, a combat-proven craft, uses Aerotec pressure switches and a new dual float switch suitable for tip or pylon mounted auxiliary fuel tanks. Boeing has long used Aerotec valves, float switches, and pressure switches on their famous planes.

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Engineering Associates, 1621 N. Grismer Ave., Burbank, Calif.

Pre-Aged Rectifiers

A new series of low-voltage selenium rectifiers which are pre-aged to assure constant output over an extended cell life are being manufactured by Electronics Devices Inc.

Essentially designed for ground-based instrument applications, the new rectifiers, called Minisels, are said by the manufacturer to have a guaranteed constant-output life of 2,000 hours when operated at ambient temperature of 40C, or 1,000 hours at 50C.

The Minisel rectifiers are manufactured in standard configurations: half-wave, center-tap, doubler, ⅓ bridge, and full bridge. Individual cells are rated at 10 v.a.c. input and 5 ma. d.c. output. They can be made up for input ratings up to 36 v.a.c. and output ratings up to 10 ma.

Electronics Devices, Inc., Precision Rectifier division, 429-12th St., Brooklyn, N. Y.

Terminal Seals Tight

An improved terminal for use with hermetically sealed electrical components in military applications is being marketed by International Resistance Co.

Toughly built to withstand rough handling on production lines where it is a sub-assembly part, the terminal, Type HS-1, is designed to meet MIL-T-27 specifications. It has a molded body, made of M. W. Kellogg's "Kel-F" plastic which is chemically inert to organic solvents, acids, etc. The part has zero water absorption and high resistance to thermal shock, through a temperature range from −70 to 190F.

A solder seal type, the terminal has a solder seal ring which is insulated from the center terminal rod by the plastic. Other details: dielectric strength −5000 v. (rms.) 60 cps.; corona starting voltage—over 2000 v. (rms.) 60 cps.; overall length—1⅛ in.

International Resistance Co., Special Products division, 401 N. Broad St., Philadelphia 8.

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LETTERS

No More Muroc

Please stop calling us "Muroc." The dry lake, of course, is still referred to as Rogers Dry Lake, which is correct, but the Air Force Base, and the "town" are now officially named Edwards. Those of us who knew Capt. Glenn Edwards would so much appreciate it if all publications would use our correct title.

"SPOKESMAN"
Air Force Flight Test Center
Edwards Air Force Base
Edwards, Calif.

Woops!

May I call your attention to the front cover of AVIATION WEEK, Jan. 7, 1952 Goodyear advertisement.

I might be wrong, but I can't see any reason for having left hand threads on the bolts that hold the brake disc on the Martin 4-0-4. If I am right, some one ought to be severely reprimanded for safetying those bolts backwards. I sincerely hope that is not the practice of Glenn L. Martin Co.

R. E. MILES
Aviation Services
Hayward, Calif.

(Another reader, John P. Nowak, Lemon Grove, Calif., also inquired about this installation. We quote from Goodyear's reply. —Ed.)

. . . In the interest of good layout, the negative was "flopped over" and, as a result, all the safety wiring on the installation appears to be safetied backward. The safetied studs . . . definitely show in the picture that they are safetied backward, because the threads are actually right hand threads. We noticed this too late to make any corrections and, therefore, the picture was published with the safety wiring appearing in error.

K. E. GEMPLER
Aviation Products division
Goodyear Tire & Rubber Co., Inc.
Akron 16, Ohio

Praise

I have just finished reading your editorial, "Crashes & Brass Tacks," which appeared in the February 18, 1952 issue of AVIATION WEEK.

The editorial is excellent, especially paragraphs eight, nine and ten.

DONALD W. NYROP, Chairman
Civil Aeronautics Board
Washington 25, D. C.

I have had a lot of fine comments on your story about Los Angeles Airways, and I want you to know that I appreciate it. . . .

C. M. BELINN, President
Los Angeles Airways, Inc.
P. O. Box 10155, Airport Station
Los Angeles 45, Calif.

My heartiest congratulations for the very thorough manner in which David Anderton treated our Diesel aircraft engine development in AVIATION WEEK Feb. 4.

L. M. BARTON, President
Diesel Power, Inc.
Brod Head Hotel
Beaver Falls, Pa.

Have just finished reading the excellent article George Christian wrote on California Central Airlines . . . . We have ordered 5,000 reprints for widespread distribution in airplane seat pockets, ticket counter literature holders and direct mail pieces.

HAL FEYER,
Director of Public Relations
California Central Airlines
Lockheed Air Terminal
Burbank, Calif.

Real Coffee

As a million-cupper of coffee drinking, I read with amusement Capt. Robson's article, in which he inquired why some airline did not attempt to feature "the best cup of airborne coffee."

Capt. Robson might be equally amused to learn that one airline has been doing so for the past year. Coastal Cargo Co., Inc., a non-scheduled airline, temporarily converted to the movement of the U. S. troops, apparently decided that the Army merited decent coffee en route overseas. Coastal installed a two-gallon percolator on its C-46s, and had the coffee-maker rigged to run off the 24-volt system—with the result that the airborne GIs can sit back and smell their coffee brewing at nine thousand feet! There is an inherent guarantee that the stewardesses make fresh coffee: after all, no stewardess is going to dare serve her pilots with a diluted cup!

UAL TOO–DC-6 hostess draws cup at "drinkable temperature" from new GE unit.

MARY M. ANDERSON
20 Terrace Avenue
Hasbrouck Heights, N. J.

Presses Needed

Underscore structural efficiency as one of the major profits from large press forgings,

and by all means continue to spotlight the press forge program. The forging process lets the designer put the material where he wants it. Sections weakened by rivet or bolt holes can be reinforced around the holes. Sections requiring stiffening can be integrally stiffened, not just longitudinally but transversely as well. Tapered sections, complex sections, even complicated sections having double curvature should be easy—if we could only get the forging capacity and experience.

Press-forged test specimens for research have been as unavailable as your report indicates press-forged aircraft components have been. Theoretical studies, and tests of cast prototypes, however, all confirm that press forging would permit numerous, and in many cases unexpectedly large, gains in structural efficiency. From the standpoint of structural efficiency alone, that is, from the standpoint of reducing the structural weight of American aircraft, large forging presses are clearly urgently needed.

N. F. D.
Langley Field, Va.

Scare Headlines

We have just seen the ad which you placed in Editor & Publisher under the subject, "Fighting Unfair Headlines."

We feel your action is an outstanding service to the industry, for which we want to express our thanks on behalf of Mid-Continent.

Hugh Coburn,
Vice President-Traffic & Sales
Mid-Continent Airlines
Kansas City, Mo.

. . . Congratulations on this editorial, and further congratulations on your work during the year 1951. More power to you!

E. S. Land, President
Air Transport Assn.
Washington, D. C.

Thanks for sending me a copy of the full-page advertisement that Aviation Week has placed in the Dec. 29 issue of Editor & Publisher.

On behalf of Capital Airlines, I want you to know we are most appreciative of this action on your part. . . . The fact that a magazine of your prestige would spend money to place this matter before the readership of Editor & Publisher, in my opinion, will make it a most effective public relations piece for our industry.

I think the good which your objective presentation will do will pay dividends to our industry. . . .

Hayes Dever,
Secretary and Director of Public Relations
Capital Airlines
Washington, D. C.

Aviation Week and McGraw-Hill are to be congratulated for publishing your editorial of Dec. 17 in Editor & Publisher.

This did the industry a great deal of good, for which we all should be most appreciative.

R. E. Johnson,
Vice President
United Air Lines
Chicago 38, Ill.

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Due to the rapid expansion of our organization it has been found necessary to acquire larger premises. We are now installed at:—

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4305-15 West 24th Place, Chicago 23, Illinois

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The Bendix Ignition Analyzer is available for either airborne or portable-airborne installations. It can be used with either high or low tension magneto or battery ignition. It is the ignition analyzer that can predict spark plug failure before it occurs . . . make an efficient check of more than one spark plug at a time and do so on a large, easy to read screen . . . yet it costs less than comparable analyzers.

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Crashes Spur Action on Prop Reversals

- **CAA experts go into huddle with manufacturers in effort to eliminate dangers of in-flight reversal.**
- **Eight known instances of accidental reversal on transports in flight, 15 on ground are revealed.**

By E. Lee Moore

In an effort to eliminate accidental propeller reversal on transports during flight—a problem now considered serious in light of recent crashes—two teams of civil aeronautics experts flew from Washington last week to confer with West Coast manufacturers.

Their purpose is to examine various types of propeller circuits looking for potential trouble points. They are under orders from CAA Administrator Charles F. Horne to take any steps necessary to eliminate recurrence of known in-flight prop reversals and to search for other possible propeller wiring dangers.

The visit to transport manufacturers was spurred by the revelation that the National Airlines DC-6 which crashed into Elizabeth, N. J., last month killing 52 was found to have one of its props in reverse gear. It was pointed out that a sudden reversal of prop can lead to a crash because of the resultant loss of lift, abnormal control forces and slowing of speed.

▶ **Eight Known Cases**—CAA has collected data showing that there have been eight confirmed and six suspected cases of accidental in-flight prop reversal in airline operations to date. There have been 15 known cases of accidental reversal while transports were on the ground. The failure rate, compiled from the known cases, is equivalent to one accidental in-flight reversal per 1,033,177 engine flight hours.

At least two airlines have experienced fatal prop reversal in flight the last three years and two other fatal crashes are suspected to have resulted from the same cause. One near-fatal crash was due to prop reversal.

▶ **The Teams**—The two teams of CAA specialists will try to coordinate two industry groups working concurrently to end the risk of accidental prop reversal. One team is an aircraft design group to work on prop installations and accessories. The other is a propeller design team.

The aircraft design group is led by CAA powerplants engineering expert David L. Posner. Other members are Donald B. Miller, from Posner's office, Irving Fagan, electrical specialist of CAA Airframe Equipment Engineering, and Nicholas S. Dobi, aeronautical research development and design engineer of the Airworthiness division of CAB Bureau of Safety Regulation. They will visit Douglas, Convair, Lockheed and Boeing plants on the Coast, in conference with Curtiss and Hamilton Standard propeller experts, local CAA engineers and airline and pilot representatives. Later, they will visit the Martin plant.

The propeller design team includes J. C. Morse, CAA prop design evaluation specialist, and E. F. Critchlow, CAA powerplants flutter and vibration experts. They will work mostly with Curtiss and Hamilton Standard experts, but all will make the trip to visit aircraft manufacturers.

▶ **Battle of Reversals**—Quest for foolproof propeller reversing systems has been a continuing effort since the design, construction and type certification of all postwar transports with reversible props. But every time the airlines and manufacturers thought they had the system refined, another instance of actual or suspected accidental prop reversal turned up.

Here's a brief chronology of important incidents in prop reversal history and efforts made to prevent recurrence.

• **NEA Convair, Portland, Me.** on Aug. 11, 1949, a Northeast Convair was in final approach to Portland, Me., when both props went into reverse gear (after the pilot pulled back both throttles). The plane dropped onto the airport, buckling the landing gear and starting a fire. All 28 aboard escaped.

Cause was found to be a stuck solenoid. It was disclosed that the NEA pre-landing checklist didn't include positive check to see whether solenoid was stuck. This solenoid is the so-called manual throttle locking device. It has a prominent red warning flag.

Increased maintenance for prevention of recurrence was ordered.

Some CAA-CAB experts believe that a stuck solenoid is a conceivable cause of the National Airlines crash at Elizabeth.

• **NWA 2-0-2, Minneapolis.** On a Northwest training flight north of Minneapolis Oct. 13, 1950, a Martin 2-0-2 crashed, killing all six aboard. The right prop was found in reverse gear. Chief theory as to cause was that during feathering of prop an intermittent short occurred in the system, causing it to reverse.

During the investigation, two previous instances of accidental reversal were disclosed. A Martin test pilot experienced one in flight but managed to keep control of the plane and make a forced landing. Cause of that one was a special test installation put on the plane improperly.

There also was a previous accidental reversal during ground runup at the Martin plant. This one was traced to intermittent shorting in the junction box in the nose-wheel well.

During CAB hearing on the Minneapolis crash, Hamilton Standard propeller's service engineer, Wilford H. Shaw, testified that the 2-0-2 (and the DC-6) did not have separate conduits for prop reversal circuits, although such was recommended by Hamilton Standard. Here are the most pertinent statements which Shaw made at this hearing.

"In the basic recommendations that we make to our frame manufacturers . . . we have always recommended that a good deal of attention be paid to both the solenoid circuit and the propeller control circuit; preferably that at least the solenoid circuit, if not both, be carried from the nacelle, from the engine nose, back through the nacelle and the wing into the airplane structure through the nacelle and the wing into the airplane structure in separate conduits."

Question by CAB presiding officer Van R. O'Brien:

"Do you know whether or not that kind of installation was found on the Martin 2-0-2 aircraft?"

A: "No. I believe that the solenoid wires—at least—are carried in a bundle with other wires, miscellaneous wires which are present there for various reasons.

"And furthermore, the junction or the breaks in the solenoid wire which come at various junction points in the aircraft structure are made on normal

junction boxes and standard terminal strips. I don't think I am qualified to say more in detail in that connection."

• **NWA 2-0-2, Reardon, Wash.** A Northwest 2-0-2 crashed near Reardon, Wash., on Jan. 16, killing all 10 aboard. Both props were found in forward thrust position, but in different pitches. The plane was damaged beyond chance for analysis.

Only real clues to the still-unsolved crash: Just before the crash pilot called Spokane and said: "We're in trouble. The wheel has gone nuts! Going down fast." The rudder tab was found turned 8 deg., giving 10 deg. left rudder, indicating the pilot had possibly encountered an unbalanced condition caused by prop or engine trouble.

Although there was no definite evidence of prop reversal, the outside suspicion combined with past experience was enough for CAB Accident Investigation Bureau to recommend to CAA Administrator separate conduiting of prop reversal circuits on all transports using Hamilton Standard props. But the change already had been made on the 2-0-2 at the insistence of NWA pilots. No order was issued by CAA.

The DC-6, and later American Airlines Convairs, continued to operate without separate conduiting of prop reversal circuits.

• **AA Convair, Elizabeth, N. J.** An American Airlines Convair approaching Newark Airport Jan. 22 swerved right from the glide path and then plunged, killing all 23 aboard and eight apartment residents. Investigators know from the airport radar and location of the crash that the plane swerved right from its course, and they believe it then stalled and plunged. But the near-complete destruction of the plane leaves them with little evidence as to what might have caused a swerve and stall. Both props were found in forward thrust, but different pitch.

However, as with the similar Northwest 2-0-2 mystery at Reardon, prop reversal is a secondary suspect. The House Commerce Committee investigation leans more heavily to the prop reversal theory than most other investigators. It is argued pilot could have corrected prop back out of reversal after locating the trouble, but too late. However, there's little evidence except the swerve from course to substantiate this theory.

American had experienced one inadvertent prop reversal on a Convair during ground run-up shortly before, and had indication of shorting in the prop control circuits before that.

• **NAL DC-6, Elizabeth, N. J.** A National DC-6 crashed shortly after takeoff from Newark Airport Feb. 11, killing 32. The No. 3 prop was found reversed and No. 4 feathered.

On Feb. 13 and 14 CAA sent telegrams to its regional agents ordering all operators of DC-6, DC-6A and DC-6B to put prop reversal circuits in separate conduits isolated from other wiring to preclude possibility of inadvertent reversing. On Feb. 15 American Airlines received a similar order to isolate the prop reversing circuits on its Convair-Liner. American already had started making the change.

However, this change order by CAA was purely precautionary—an extra step to help prevent possibility of inadvertent prop reversal. There is no definite evidence that "bundling" the prop circuits with other wiring caused either the National DC-6 or American Convair crashes. Douglas engineers had never felt that separate conduiting of these wires was necessary on the DC-6, although Hamilton Standard and CAB safety investigators recommended it.

When American converted its Convairs from Curtiss props to Hamilton Standard over a year ago, it bundled the prop circuits the same as on the identical DC-6 powerplant installation for the sake of standardization—although all factory installed Convair prop systems were separately wired.

CAB Ultimatum on Coach Fares

- **Five airlines ordered to cut their night rates.**
- **Alternative, Board says, is to quit night coach.**

A 4-cent-a-mile night air coach fare appears destined to become universal among scheduled airlines, effective Apr. 1.

CAB has ordered five big airlines either to cut their night coach fares to 4 cents a mile or to get out of the night coach business. The five lines are Capital, Eastern, Northwest, United and Western.

They had refused to lower coach fares voluntarily, despite strong CAB policy statement of last December saying the lines should file 4-cent night air coach rates by Mar. 1 to become effective Apr. 1. Many airlines said they thought the timing of CAB policy was off because of rising costs. But five airlines defied CAB policy and failed to announce lower rates by deadline.

While CAB has suspended their night coach fares effective Apr. 1, it has granted them special permission to file 4-cent rates this month to become effective Apr. 1, although the general regulation requires a month's advance notice.

► **Alternative**—CAB members and staff executives generally believe the airlines must now capitulate and file coach fares of 4 cents for night operation—hours 10 p.m. to 4 a.m. Each line has the technical alternative of suspending the service rather than lowering the price. But that would defy the Board's basic intent. Its announced policy is for the airlines to expand their present coach service.

If an airline chooses to fight it out with CAB on this issue, the Board is expected to issue an immediate order to show cause why the airline should not operate the service or have CAB designate another airline to render that service. It is the chance nonscheduled airlines have been waiting for. Refusal of the five airlines to go along with CAB policy could open the door to more nonsked applications for certificates of public convenience and necessity, if the refusal is final.

The Board order suspending night air coach fares above 4 cents a mile hits Capital and Eastern hardest. They fly more coach routes than any other lines. And all their coach operations are night coach at above 4 cents a mile. In the 12 months ended last June Eastern earned about $2½ million on coach operation and Capital a half million, according to CAB estimates. Managements of both companies went into executive session last week to consider the Board ultimatum to lower their coach fares.

► **Other Cases**—In the cases of North-

Coach Fare Status

Route	1941 Fares	Voluntary Changes Filed as of Mar. 1	CAB-Ordered Change by April 1
N. Y.-L. A.			
(AAL, TWA)	$110 (4½ cents a mile)	$99 (4 cents a mile)	—
N. Y.-S. F.			
(TWA, UAL)	$110 (4½ cents)	$99 (4 cents)	—
N. Y.-Seattle			
(NWA)	$118 (4½ cents)	—	—
N. Y.-Miami			
(EAL)	$58 (4½ cents)	—	$43 (4 cents)
(NAL)	$50 (4½ cents)	$43 (4 cents)	—
Chicago-Miami			
(EAL)	$55 (4½ cents)	—	$49 (4 cents)
(Delta)	$55 (4½ cents)	$49 (4 cents)	—
N. Y.-Atlanta			
(EAL, Capital)	$50 (4½ cents)	—	$32 (4 cents)
N. Y.-Houston			
(EAL)	$71 (4½ cents)	—	$62 (4 cents)
L. A.- S. F.			
(UAL, WAL, C-A Central)	$12 (3½ cents)	—	—
S. F.-Seattle			
(UAL, WAL)	$31 (4½ cents)	—	$25 (4 cents)

Source: CAB; Fares to Nearest Dollar

west, United and Western, the business importance of night coach is relatively less. CAB only contests United and Western's San Francisco-Seattle fares; their Los Angeles-San Francisco coach operations are already down to 3½ cents a mile due to competition from intrastate carrier California Central. And United's transcontinental fare is not affected by the Board order. It is a day coach priced at about 4 cents a mile. Northwest's transcontinental day coach operation is approved on price at 4½ cents, but Northwest failed to lower the fare on its New York-St. Paul coach.

American, TWA, National and Delta moved to cut their coach fares in line with CAB policy before the Mar. 1 dealine; all but Delta moved more or less voluntarily due to competition on the transcontinental and New York-Miami routes. Delta, though it strongly objected to lowering its fare, made an eleventh-hour tariff amendment to avoid the wrath of CAB.

But although American Airlines is technically in the clear, it has defied CAB coach policy in one respect: CAB argued all winter trying to make American start a short-haul coach service. American refused, choosing instead to concentrate on the lusher transcontinental operation. In fact, when American recently added a Washington stop on the New York-Dallas-West Coast coach it insisted on charging standard fare for the segment between New York and Washington. Then Eastern Air Lines suspended coach rates on the New York-Washington segment of its New York-Houston coach.

▶ **Plane Conversion**—CAB has ordered Northwest to convert its coach DC-4s to 64 passengers, as TWA has promised to do. Northwest's DC-4s now seat 55 and TWA's 60.

However, CAB is not going to quibble right now. First insistence is that all existing night coach rates drop to 4 cents a mile or less. When that's established as the Board expects by Apr. 1, then CAB may take new measures to assure expansion of coach.

United and Western may re-schedule their West Coast fares to get around CAB order reducing their San Francisco-Seattle night coaches from 4½ to 4 cents a mile. CAB officials say a little juggling of schedules will allow them to complete these flights before the CAB-designated "off-peak" hour of 10 p.m. or after 4 a.m.

BOAC Profits

BOAC showed a net profit of $1,414,000 Dec. 31, the end of the first three quarters of its fiscal year. For the calendar year 1951, BOAC showed its first 12-month profit, $1.8 million. For the first nine months of its 1950 fiscal year BOAC lost over $8.8 million.

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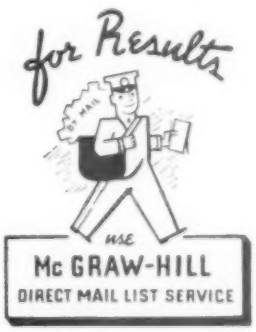

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"ADMINISTRATION BUILDING" above is typical of those on Aviateca's jungle routes.

Aviateca Blazes a Jungle Trail

Guatemalan carrier racks up ten-year fatality-free record despite operations over rough territory.

(McGraw-Hill World News)

Guatemala City—Aviateca, Guatemala's government-controlled airline has rounded out ten years of scheduled operations with no fatal accidents. This, in spite of operating conditions and airstrip facilities that often verge on the primitive.

With a fleet of 11 DC-3s and C-46s, the airline is a vital link to all parts of this republic—about the size of Ohio—regularly serving points such as the Peten area in northeastern Guatemala, which cannot be reached by any other means of transportation. At Peten, where airstrips have been hacked out of the jungle by native woodcutters, planes come in daily, bringing in necessities such as food and taking out large quantities of chicle.

► **Expansion**—Aviateca has plans to enter the international field as Guatemala's national airline, and already is operating to neighboring British Honduras. It plans to start operations between the Republic of El Salvador and Guatemala soon. Officials state that as soon as additional equipment becomes available, their scheduled routes will be extended further. In the meanwhile non-scheduled flights between Guatemala City and New Orleans are made almost weekly with cargo and passengers.

The carrier is unusual in that mail pay constitutes only about 2% of its income; yet it operates in the black without any Government subsidy.

Statistics released by Aviateca for 1951, show:

- Passengers carried (local), 72,967; income, $510,121.
- Passengers (international), 1,028; income, $16,046.
- Baggage, 206,232 lb.; income, $9,110.
- Mail, 11,099 lb.; income, $2,251.
- Air cargo, 9,714,085 lb.; income, $460,807.
- Total income, $998,335.

Aviateca statistics also disclose that in the calendar year of 1951, a total of 1,083,344,473 ton miles were flown, and the hours flown by the airline's planes totaled 7,863.55.

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Air France to Mexico

Air France will start service between France and Mexico, via New York, next month, flying two trips weekly each way, Henri Lesieur, general manager of the North American and Caribbean division of the carrier, has announced. A bilateral agreement between the two countries is expected to be completed in a short time.

SHORTLINES

► **All-American Airways** has transferred its New York terminal from Newark Airport (closed) to Idlewild—added new flight schedules from the latter airport last week.

► **Air France** is equipping its new Constellation and Viscount fleets with Sperry Zero Reader, Gyrosyn compass and engine analyzers (Conmic only). . . . Ordered $700,000 Hamilton Standard propellers and parts last month.

► **Air Transport Assn.** interline business cleared in January totaled $26,441,029—up 29% from a year ago.

► **Canadian Pacific Air Lines** reports it flew 127,358,760 passenger miles and 1,234,099 freight ton-miles last year. Unduplicated route mileage served is 27,399 mi.

► **British European Airways** carried 56,000 passengers this Jan., 29% over a year ago.

► **British Overseas Airways** plans to be operating jet Comets in passenger service from New York to Nassau and Bermuda within 15 months. . . . Scheduled Comet time London-Rome is 2½ hours, London-Cairo 5½ hours; this is comparable to a 5½-hour jaunt New York-Los Angeles, BOAC says.

► **Chicago & Southern Air Lines** has bought two more Convair-Liner 340s, previously on option. This brings the C & S Convair order to ten at total cost of about $8 million. Present fleet includes six Constellations and 12 DC-3s. Deliveries will start in June, next year.

► **Hawaiian Airlines** has a CAB show-cause order setting mail pay an estimated $482,075 retroactive to last July 1. New sliding-scale rate is designed to yield the line a break-even point at load factor of 56%, and a return on investment of 5½% to 12½% if load factors range from 60% to 80%.

► **International Air Transport Assn.** reports December's international clearings at $17,092,000—up 13½% from a year ago.

► **Mid-Continent and Continental** have started daily one-plane service between St. Louis and Denver via interchange at Kansas City.

► **Ministry of Civil Aviation** in Britain is still uncertain whether the Conservative Party will consolidate MCA with the Ministry of Transport, as called for in its platform. Conservatives have appointed one minister, John Scott Maclay, over both ministries, and there have been a few staff changes at the working level. But aviation and other transport operations are operating separately, as before.

► **Piedmont Aviation** will get a 10-year renewal of its local service route certificate if CAB follows the recommendation of Examiner F. D. Moran. The examiner cites Piedmont's outstanding record, and he points out that 10-year certificates will give locals more permanence, thereby increasing their credit standing and their attractiveness as a market for short-haul aircraft and equipment.

► **Sabena DC-3** crash Feb. 4 at Kikwit, Belgian Congo, killed all 15 aboard. Cause is unknown. Plane was en route

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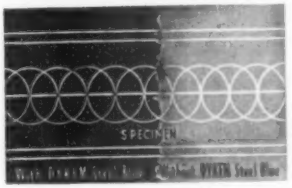

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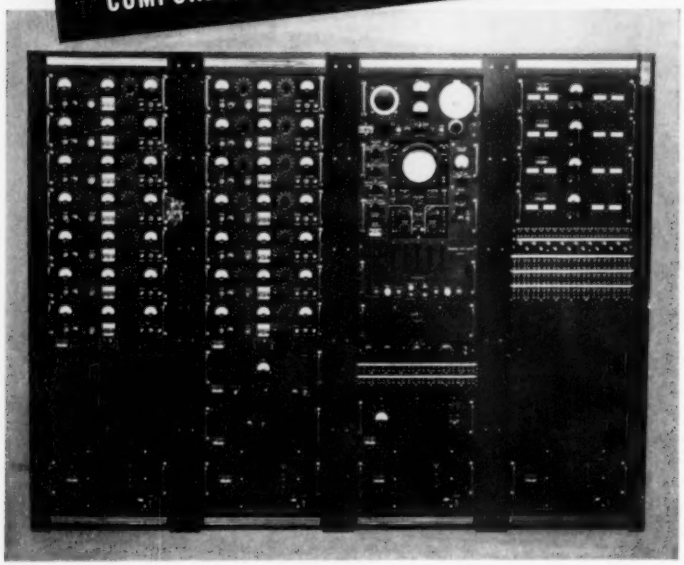

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► **San Francisco** reports airline trip arrivals and departures gained 24% in 1951 to 101,613 total. Passengers enplaned and deplaned gained 21% to 1,450,537. Freight on and off gained 9% to 35,356,903 lb.

► **Seaboard & Western Airlines** reports flying 6,717,391 revenue miles on commercial and military contract operations in 1951, with average utilization 13 hr. 6 min.

► **Swissair** reports a 17% gain in passenger miles in 1951—to 6,588,418. . . . Carrier's DC-6B flight New York-Geneva in 10 hrs., 27 min. set a record for the run; company claims the Gander-Shannon time of 5 hr., 5 min. on this flight is also a commercial record. . . . Is the only carrier already flying DC-6Bs between U. S. and Europe.

► **TPA Aloha Airline** flew 12,190 passengers in January, a 43½% gain over a year ago.

► **Trans-Canada Air Lines** in starting trans-Atlantic air coach May 1 will merely reduce the price of its present DC-4M service to coach rates instead of operating both premium and coach service. TCA will not increase the 40-passenger seating of its planes but will charge for meals and reduce free baggage allowance to 44 lb. Round-trip rate Montreal-London is to be $477 compared with present rate for the trip of $686.

► **Trans World Airlines** has DPA approval for rapid (5-year) tax write-off of $55,029,180 of new transports and $6,623,991 spares and equipment. The DPA certificate permits accelerated amortization of 80% of those amounts. Transports covered are 40 Martin 4-0-4s, 10 Super Constellations and 25 Constellation 749As. . . . Reports its 1,894,724,000 revenue passenger mi. in 1951 were 29% over 1950. Domestic traffic gained 36% and foreign 8%. Revenue ton-miles gained 26% and passenger load factor went to 73½% compared with 1950's 64.7%.

► **United Air Lines** President W. A. Patterson says an employe stock purchase plan is under study. . . . Vice President Harold Cracey says overocean coach service to Hawaii is a long way off because the regular luxury rate is already 6 cents a passenger mile compared with 7 cents for the new trans-Atlantic coach services starting in May.

► **Wisconsin Central Airlines** certificate has been renewed to Sept. 30, 1955, by CAB.

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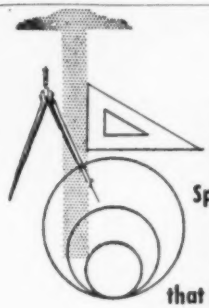

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P-3532, Aviation Week
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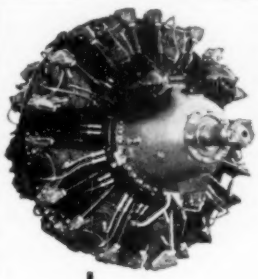

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COCKPIT VIEWPOINT

By Capt. R. C. Robson

Let's Face It—We Must Simplify Aviation

In a previous Cockpit Viewpoint column (AVIATION WEEK Feb. 4) several items were mentioned which an air safety committee should consider in order to make flying safer. We now continue this subject; this time the theme is: Simplify Aviation.

Action on simplification has been blithely ignored for years. Every day our system becomes more complicated. The usual acronautical procedure when action is needed is: 1. Pass a new regulation, or, 2. Install a new gadget, or 3. Start another training campaign to raise the caliber of aviation personnel.

► **Confusion Compounded**—These steps merely add to the confusion. We already have an overabundance of regulations. Pilots must necessarily spend a disproportionate amount of time just trying to "stay legal." This diverts time and energy from flying safely. Likewise, the modern cockpit is cluttered with gadgets whose function is to check the adjacent instrument because none of them is to be trusted alone.

Let's face it. There have been enough tragic accidents in the past year to indicate that possibly something is wrong with our system. Nature has worked for thousands of years to produce Homo Sapiens; yet he is still fallible. Perhaps we should pay more attention to fitting the machine to him and not the other way around.

Obviously we cannot run out and secure new airplanes. Nor can we scrap all radios, landing aids and instruments. But we can simplify. In fact if pilots and their passengers are to survive we MUST simplify.

Several years ago the International Civil Aviation Organization (ICAO) was formed. Its object is to standardize aviation in all countries.

ICAO has done many worthwhile things. But, in order to standardize, compromises must be made. American delegates cannot always insist on the American system for the standard and many times it is not the best. So we must accept certain changes. **Whether these are good or bad depends on what is changed and whether it simplifies or complicates.**

► **Tied Up in Knots**—Recently the unit of velocity of winds aloft was changed from statute miles per hour to nautical miles per hour, expressed in knots. Since upper wind reports are notoriously inaccurate this change caused no trouble. A report of 30 can be mph. or knots. It makes no difference. Good bet is that the pilot will find actual velocity somewhere between calm and 60.

Latest change is to convert cockpit airspeed indicators to knots. This will make a difference, for now we are tampering with the fundamental of flight. Modern airplanes are extremely intolerant of airspeed errors when approaching for landing.

We give the pilot a "foreign language"—an extra mental calculation—and we have installed another hazard. This change is dangerous.

► **Tain't Funny**—Let us remember that ancient proverb "Maintain thine airspeed lest the earth arise and smite thee." This may be humorous to read but at some future date the relatives of dead passengers will find little humor in the fact that the pilot was doing mental calculations, forgot to move the decimal point and stalled the airplane.

There is no argument that the metric system, absolute temperature scale and similar standards are superior to American methods. But to American pilots they are foreign languages, unnecessary and unsafe.

Present day cockpits are full of this clutter. Thermometers may read in Centigrade or Fahrenheit, fuel quantity gauges in pounds or gallons; soon we will have a new phonetic alphabet, and there are other double standards. Now we are getting into knots.

As a fellow pilot once said, "Now if we can only get the altimeters to read as fathoms, we'll be all set."

WHAT'S NEW

New Books

Titan—System No. 41, latest volume of the Gmelin Handbuch, 511 pages, 100 graphs, 22-page index, available from Walter J. Johnson, Inc., 125 E. 23rd St., N. Y. C., or Stechert-Hafner, Inc., 31 E. 10th St., N. Y. C., price $27.20.

This comprehensive collection of world literature on titanium, up to Jan. 1, 1950, systematically arranged and critically reviewed, embraces the geology, geochemistry, metallurgy, chemistry, physics and technology on this intriguing material, which is being explored with great interest by the aviation industry. The information is so arranged that any phase of the subject may be readily located. The Handbuch is written in German.

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Precision bearing catalog, 136 pages, designed to aid in bearing selection, is a section-alized, indexed ready reference available from McGill Manufacturing Co., Inc., Valparaiso, Ind.

Publications Received

- **ASTM Standards on Engine Antifreezes** published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1951, $1.00. A compilation of the nine ASTM methods of test and specifications pertaining to engine antifreezes.
- **Aerodynamics of the Helicopter,** by Alfred Gessow & Garry C. Myers, Jr., published by The Macmillan Co., 60 Fifth Ave., New York 11, N. Y., 1952, $6.00. A practical guide to the basic factors affecting the aerodynamic behavior of rotating-wing aircraft.
- **The Principles and Practice of Aviation Medicine,** by Harry G. Armstrong, M.D., published by the Williams & Wilkins Co., Baltimore, Md., 1952, $7.50. A report of the latest developments and the newest methods of examination and treatment in the field of military and commercial aviation.

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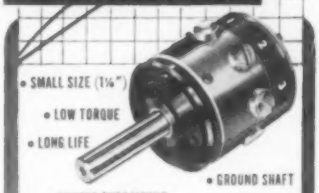

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EDITORIAL

Hensley-Davis Critics Have Their Say

[We give our page today to expressions from some CAA employes who are fed up with conditions in the Office of Aviation Safety of the Civil Aeronautics Administration. A two-paragraph editorial here Feb. 11, and an editorial here last week, are still bringing in mail from critics of E. S. Hensley, Director, and William Davis, his deputy, in OAS. Several years of increasing political intrigue were culminated recently by a reorganization. Obviously, if we were to reveal names of correspondents we would jeopardize their jobs. —R. H. W.]

It's Odoriferous

[From a CAA Safety Employe in Washington]

. . . When someone somewhere is in a position to set aside all established rules and regulations; when the evaluation of the administrative and supervisory ability of every damn Grade 13 and higher is dependent to a large extent upon an interview behind closed doors; when the entire process of evaluation and selection is conducted in a unilateral manner by the existing "top" management, there is bound to be a slightly piscatorial odor!

The fact of the matter is, the top-level administrators who are responsible for whatever conditions exist at the present time—and have existed for the past several years—have been allowed complete latitude in the present "shuffling" and those same top-level administrators will continue to be responsible no matter what changes are made in the "lower" brackets! Boy! What better opportunity could they ask to "manipulate" to their heart's content. . . . Maybe the time has come to cover up the trail, as the old saying goes. . . . By the way, your information that there has been only ONE objection, and that because of medical reasons, is just so much hogwash. . . .

Davis' Puppet Show

[From a CAA Employe in the First Region]

"What Goes on at CAA?", your editorial of Feb. 11, is timely indeed. I offer the following comments, based on years . . . in Air Carrier Maintenance. Deputy Director William Davis is in my opinion . . . the man responsible more than anyone else for this . . . shakeup. . . . Mr. Davis has set this up as a puppet show, with himself working the strings. . . . He has been successful in placing "trusted" employes in charge of the smaller Aviation Safety District Offices. . . . These employes have established their empire with Davis' sanction. To justify this nonsense from a "budget" standpoint, these district offices keep a chain of memorandums and other correspondence flowing to the regional offices.

A survey of the approved schools will reveal one of the biggest jokes in aviation history. It takes baskets of paper to set up a non-schedule operation. . . . It is the option of the district offices as to whether they certificate "small" (under 12,000-lb.) aircraft or not. Example, at Teterboro they do; at Syracuse they don't. . . . One CAA man supervised about 140 transport-type aircraft at Teterboro in 1946 and 1947. Now the same man has the back-breaking load of about six aircraft. Does he stay busy? Sure; we have such complicated procedures and red tape systems. I laugh in my sleep as I wonder how long Mr. Davis and Mr. Hensley will continue to rook the public by throwing up a wall of papers that hide our real motives. We want to grow & grow & grow; a few more Indians and we can justify several more chiefs, and their pay is not hay either, brother. I would like to take just a couple of hours sometime and give you a bird's-eye view of our over-stuffed, "over-worked" agency.

The attached newspaper article (from the N. Y. Journal American) on illegal transport of liquor into this country (destined for CAA men and their friends) is essentially correct. I know. No one was hurt; it was squashed. There were too many CAA big shots involved. A little tracing will reveal that Mr. ——— (one of the top CAA Safety officials) had several cases shipped by Harlow. It passed through Newark, was handled by the supervising agent. I ask you, how do they do it? Others in this area have cases typical of CAA. We are putting on the white-wash.

Stench of Politics

[From Six 'Vogelentes' in the Sixth CAA Region]

After reading your editorial Feb. 11, several Vogelerized employes would like to make comment.

We believe the morale, spirit, esprit de corps and fiber of this organization has reached the nadir of despond. The stench of politics, the intrigue and the petty cabals. . . .

The output in work units in Aviation Safety could be equaled by a 9-year-old moron in an iron lung; even the CAF-3 stenos are plaintively wondering "when the word will be passed," and the higher-ups help gather in little clusters like "before-the-battle-mother" children in a high school dormitory.

This despicable, immature and undesirable situation does not need to exist. We have a National Promotion Plan—not too good to be sure, but good enough; we have excellent men among us, men who are eager to do a good job, men who are firm, courageous, intelligent and honorable. We have men of excellent record, whose accomplishments are outstanding. But the men who are tapped for the job are the men who are "on the team," and the men on the team are not those men who are capable, firm, courageous. . . .

So we have a National Promotion Plan. In October three Washington representatives arrived in various regions for the purpose of administering a written examination and an oral examination. . . .

But a man's record, his accomplishments, his actions, what he stood for, and what he IS could easily be overlooked and by-passed by the oral interview. If a man was capable, but was not a "team member" he could be down-graded merely by giving him a low grade on the oral interview. Quite handy, wasn't it?

This is not to say that all the men selected were of poor caliber. Some very strong men were selected. But as a whole, the selections were poor—so poor that a tremendous amount of criticism has been directed at the selections, and the Little People are aghast at the unfairness, the innuendo, the hypocrisy of it all. . . .

We Right-Wing employes have an unhappy vista and future. If we object, we are transferred, down-graded, demoted in position, and made the subject of gibes. In this region one employe has actually done nothing for six months, the reason being that the administrator was attempting to "freeze" him out of the region and out of his job.

Another employe, a successful business man on week-ends, has been demoted not on his record, but because of a sadistic tendency toward revenge on the part of the regional boss. Employes who have a record for failure and inability to produce have been promoted.

It should not take too much in the way of investigation to prove this, and if such is the situation here, it must be very similar in other CAA offices. It would be a pleasure to take part in a clean-up campaign, and if one could see a victory instead of a failure, followed by reprisal, one would take part. It would seem that this is a job for the press, however, and not for the individual employe. . . .

'Politics, Intrigue . . .'

[From a CAA Employe]

. . . I wish to add to your comment that very few of us in CAA agree with the selections. . . . As a member of CAA for 15 years, less some military service, my position is one of some trust; it is also one of experience, and never has the morale been so low, the prestige so diminished, and the confidence so lacking as it is today. Selections were made on the basis of politics, intrigue, and boot-licking, despite the assurances that there was a four-way basis for selection (National Promotion Plan, written exam, oral interview, and group interview).

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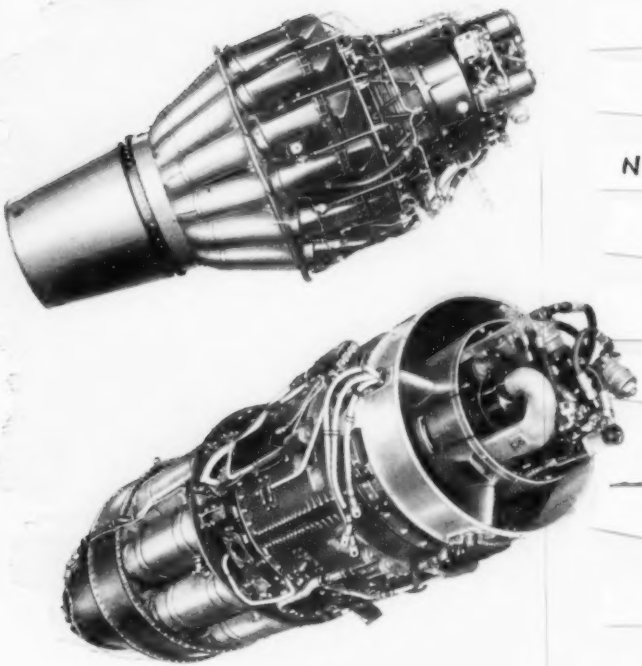

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